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FRANCIS GALTON, Esq., F.R.S., *President, in the Chair.*

The Minutes of the last meeting were read and signed.

The following presents received since the last meeting were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From the AUTHOR.—Il Tabù. By Giulio Barroil.

From T. V. HOLMES, Esq., F.G.S.—The Essex Naturalist. No. 12. December, 1887.

From the DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY.—Mineral Resources of the United States. 1886. By David T. Day.

From the ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.—The Scottish Geographical Magazine. Vol. iv. No. 3.

From the BATAVIAASCH GENOOTSCHAP VAN KUNSTEN EN WETENSCHAPPEN.—Tijdschrift voor Indische Taal-, Land- en Volkenkunde. Deel xxxii, Aflevering 2.

From the ACADEMY.—Zbiór wiadomo ści do Antropologii Krajowéj wydawany staraniem Komisyi Antropologicznéj Akademii Umiejętności w Krakowie. Tom. xi.

From the ACADEMY.—Rocznik Zarzadu Akademii Umiejętności w Krakowie. Rok 1886.
From the INSTITUTE.—Report of the Council of the Royal Colonial Institute for the year 1887.
From the UNIVERSITY.—Calendar of the Imperial University of Japan for the year 1887-88.
From the SOCIETY.—Proceedings of the Society of Biblical Archæology. Vol. x. Part 4.
—— Journal of the Society of Arts. Nos. 1841, 1842.
—— Proceedings of the Royal Geographical Society. 1888. March.
From the EDITOR.—Nature. Nos. 957-959.
—— Science. Nos. 263, 264.
—— The Photographic Times. Nos. 336.
—— L'Homme. 1887. Nos. 22-24.
—— Bullettino di Paletnologia Italiana. Tom. iii. N. 11 e 12.

EXHIBITION *of* TERRA COTTA TABLETS *from* BABYLONIA.

By CUTHBERT E. PEEK, Esq., M.A. (Described by T. G. PINCHES, Esq.)

A COLLECTION of Babylonian clay tablets belonging to Sir H. Peek, was, in the absence of Mr. C. E. Peek, exhibited by Mr. T. G. Pinches, of the Department of Egyptian and Assyrian Antiquities, British Museum. Most of these tablets, which had been copied, translated, and commented upon by him, came, he said, from Abu-habbah, the ancient Sipar or Sippar of the Sun-god, identified with Sippara and Sepharvaim. The earliest of these documents bore the name of Samsu-satana, a King of Babylonia who reigned about 1969 B.C. This tablet was the smallest in the collection, being only $1\frac{1}{8}$ inch by $1\frac{3}{16}$ inch. It referred, apparently, to a sale of oxen, and was dated "the 21st day of Iyyar of the year when Samsu-satana the King (was) in capturing before the land of Aa." It could not, however, be said that the translation of this date was quite certain; but if, by chance, it turned out to be correct, it would furnish an additional historical fact as to this little-known King of Babylonia. The next tablet in chronological order was dated in the 14th year of Nabopolassar, and referred to certain weaving done for the temple of the Sungod at Sippara or Sepharvaim, which city appeared to have been one of the centres of the weaving industry in Babylonia in ancient times. In referring to this tablet the speaker mentioned that the Babylonian representative of the very word used in Josh. vii, 21, where the "goodly Babylonish garment" (*addereth Shin'ar*) was spoken of, actually occurred in a list of words designating clothing of various kinds, from Assyria. The Babylonian form of the word was *âdirtu*. Other

texts were an account of the number of cattle in the possession of the shepherds of the Sungod on the 10th day of Tisri, in the 13th year of Nabonidus (542 B.C.); the amount of taxes due from certain Chaldeans in the district of Sippara or Sepharvaim on the 15th of Elul of the 14th year of Nabonidus (541 B.C.); a small tablet referring to a payment "from the house of hands" to a man named Nabû-êdir-napšāti, on the 21st day of Sebat of the 14th year of Nabonidus; a tablet apparently referring to the payment of tithes to the temple of the goddess Gula at Sippara, on the 11th day of Ab in the 14th year of Darius (506 B.C.); and a larger tablet referring to the arrangements made for supplying meat to the great temple of the Sungod at Sippara, dated the 15th day of Tisri in the 22nd year of Darius (498 B.C.). The other three tablets were undated, and were respectively a list of amounts paid, with the names of the payers; data to enable a scribe to draw up a contract for the sale of a field; and a private letter. As this last-named was short and interesting, the speaker read the translation he had made of it, which ran as follows: "Tablet from Gimillu to Nergal-uballit, my brother. May Bel and Nebo bespeak peace and life for my brother. I am just sending to thee, [Cause the seed], 600 *gur* . . . . [to be brought] . . . . says thus: 'I have seen the amount of the seed with Nergal-uballit.' Šamaš-iddina, the scribe of Sipar, will send to Babylon. I will send Šamaš-iddina to thee on the 21st day. Cause the seed, 500 *gur*, to be brought."

In commenting upon these texts, Mr. Pinches spoke of the opulence of the great shrines of Sippara or Sepharvaim, the importance of this twofold—or, rather, fourfold—city, with its glorious temples and palaces, the enormous receipts of the priests of the various temples, and the wealth of the inhabitants, as shown by the many thousands of tablets now in the British Museum, of which Sir H. Peek's texts, which he had translated, were a very fair sample. As an example of the linguistic value of these tablets, the speaker mentioned the word *nigga* or *niga*. This word, he said, was Akkadian, and apparently meant first "anything," then "everything," and from this latter meaning "property" or "wealth." This word had a Babylonian equivalent, namely, *mimmu* or *memmu*, possibly weakened from *mammu*, the plural being *memmeni* or *memeni*, probably weakened from *mammani* or *mamani*. This last was probably the Assyro-Babylonian form of the well-known word Mammon, "riches;" and if the etymology now given proved to be correct, a satisfactory explanation of a word long regarded as very difficult had been at last obtained.

The following paper was read by the Author:—

The RACES *of the* BABYLONIAN EMPIRE.

By G. BERTIN, M.R.A.S.

[WITH PLATE VI.]

WHEN I undertook, at the suggestion of Mr. R. Poole, to write the present paper, I did not realise the difficulties which I had to encounter. Accepted ideas, and, I might add, scientific prejudices, have always a great influence over our mind, and are hard to be given up. In this particular case the conclusions at which I have arrived are so thoroughly different from, and even opposed to, the accepted notions, that I hesitated a long time before surrendering myself to the evidence.

Babylonia, unlike Egypt, is not a region isolated by its geographical position, but on the contrary is an open country offering a vast frontier to the intrusion of new races. For this reason it is difficult to consider Babylonia by itself, and I have been obliged to extend my inquiry over the whole of the Babylonian Empire. This area covers the vast region extending from the Persian Gulf and the Red Sea in the south to the mountains of Armenia in the north, and from the Mediterranean Sea in the west to the mountain range in the east from Armenia to Persia. We have in this area two distinct centres of civilisation and wealth, one in Southern Babylonia, and the other in Syria.

Two causes provoke the displacement of population, namely, the wish for plunder and the pressure from a more powerful nation. Babylonia being a wealthy, civilised, and open country, was liable to invasions from both these causes, and we must therefore expect a very mixed population. Syria was, by its geographical configuration, better fitted for resistance, but was never politically organised, and had likewise to submit to invasions from the two causes, and it therefore presents also a mixed population.

Before giving a review of the types on the monuments, a few words are indispensable on the characters of these representations.

The greatest numbers of the monuments recovered are from Assyria; the explorations in Babylonia proper have never been carried on systematically or scientifically. This is to be regretted, because the really Babylonian representations are scarce, and for the types of Babylonia we have to depend often on the Assyrian bas-reliefs. The sculptures of the two countries, Assyria and Babylonia, belong, however, to the same school, so to say. They are more realistic in many ways

than the Egyptian pictures, though they are also more conventional in some points. As in Egypt, so here, the faces are represented in profile with eyes in full face.[1] The artists appear to have given great care to the representations of the facial types, but the bodies of all the different peoples are exactly the same; they differ simply in their dress. We cannot even depend on the comparative stature, for often the height merely indicates importance. The King, for instance, is always represented taller than his soldiers. It is also to be noticed on the bas-reliefs that in many cases the artists did not take so much care when they represented a man of the lower class or an enemy; these being often roughly drawn.

In Assyria we find two principal types well distinguished; the one the known Ninevite type illustrated by the representations of the Kings and their soldiers and attendants; and the other a low type, varying very much with the individuals, and found only among the people of inferior condition.

The first type presents a long head, straight forehead, slightly curved nose hanging a little over the upper lip, lips variable but often thin. Assyrians appear to have worn wigs, but, judging from those of the lower class having the same type, their hair was wavy; and we may suppose that they were of medium stature (Pl. VI, figs. 6 and 7).

The other type gives, as just noticed, many varieties, but the general characteristics are as follows:—Small round head, low slanting forehead, high cheek bones, prognathism more or less marked, but with lips often thin and a chin sometimes retreating or slanting back. The nose is often large and does not appear to have ever been flat and wide as among the Tatars; eyebrows often very prominent; generally frizzy hair and beard; stature short (fig. 8).

In Babylonia proper, though the monuments known to us are less numerous, we obtain more varied types.

The oldest, which is given by the monuments found at Tello, by M. de Sarzec, I will provisionally call *Gurian*, from the primitive national name of the Akkadians. This name is very defective, I know, and I would have adopted that of Tello, if the type had been exclusively found on the monuments of that city, which is not the case. The general characteristics of this Gurian type are: round head, low but wide and straight forehead, slightly prominent cheek bones, profile orthognate with rather fleshy lips, and a big nose, not aquiline; hair rather curly

[1] It is this fact which gave the false notion of oblique eyes in the Babylonian race, but the error of this notion is easily shown by the faces of the man-headed bulls and the few Assyrian statues.

than wavy; probably medium stature (fig. 1). This type, which appears on the monuments of Tello, and was, no doubt, that of the hero generally known under the name of Gisdubar, who is represented on many seals, seems to have disappeared before the historical period, though the portrait of Hammurabi, now in the British Museum, and of which fig. 3 is a faithful copy, has preserved most of the characteristics.

A type slightly different is offered by the portrait of Marduk-nadin-akhe (fig. 4). It is the same shaped head,[1] but the profile is different, the eyebrows being more prominent and the nose smaller, with a tendency to prognathism.

Another well defined type is the one of the Babylonians at the time of Assurbanipal. They fought in the army of the Assyrian King, but are easily recognised by their costume (fig. 5). The general characteristics are: long egg-shaped head, high forehead straight and wide, profile orthognate, flat cheeks, nose rather long but never curvy or aquiline, lips moderately thick, hair wavy, high stature. The general expression of the face is quiet and smiling, and well in agreement with the general moral character of the Babylonians; it has nothing of the stern and, I might say, brutal expression of the Ninevites.

The existence in Babylonia of the same low type, already noticed in Assyria, cannot be denied. We find it on some of the oldest monuments discovered at Tello (fig. 2), and it is easily recognised in spite of the roughness of the drawings. We detect it also among some of the Babylonian soldiers serving in the Assyrian armies.

In Elam, the great mass of the population seems to have belonged to this very type (figs. 12 and 13). It offers, however, a great many varieties; sometimes the prognathism is much developed, sometimes the forehead is nearly straight, though very low; sometimes the nose is very much depressed, and in other cases ridiculously big for the size of the head. A nobler type is presented by a small minority, the ruling family and perhaps the higher class or aristocracy. In many faces of the low type the expression is, however, intelligent, though in some cases there is a savage and cruel stamp (fig. 11).

In Syria we find equally two types. One is a variety of the low type already described and illustrated by the Jews captured at Lachish by Sennacherib (fig. 14) and by the Phœnician sailors on a bas-relief in the British Museum. The head is round, the forehead low and retreating but the nose is rarely much developed, and in many cases the lips are thick, the hair is frizzy, and the stature often medium.

[1] As it will be seen, this type does not, however, proceed from this precedent.

The other type is that of the Jews, as far as can be judged from the black obelisk. That a higher type existed in Syria we know from the Egyptian monuments, which give us representations of the Hittites and other populations, and also from the sarcophagus of Ezmanazar, on which the figure of the King has decidedly something Egyptian; this, however, may be due perhaps to the nationality of the artist.

On the Assyrian monuments are also found represented two other foreign populations, and these representations have, as will be seen, a great importance anthropologically.

The first is that of the Arabs. These do not present the type which we are accustomed to associate with the children of the desert, but in this case that which is sometimes designated under the name of Caucasian; the head is long and oval, the forehead high, the nose of moderate size and not aquiline, in fact all the lines are well proportioned. The hair is wavy, and the stature high. The rather wild expression given to the physiognomy may be a deliberate libel on the part of the artist, or due to the fact that these freedom-loving people were prisoners in the hands of the Assyrians (fig. 10).

The other foreign type is that of the Armenians, as represented by two ambassadors who visited Assurbanipal in Elam. These two specimens offer all the characteristics to be noticed in the modern Armenians (fig. 9): long head, long curved nose, fleshy lips, stature short; the general appearance is decidedly Jewish as in the modern Armenians. This Armenian type is so much more remarkable from the fact that at this period the language spoken in Armenia, and illustrated by the inscriptions of Van, is totally different from Armenian, and linguistically connected with Akkadian, Medic, and Elamite. As it could hardly be thought that the two ambassadors were of a different type from the mass of the population, or at least from the ruling population, we are forced to admit that the district of Van was then, and no doubt from a much higher antiquity, inhabited by a race exhibiting the same characteristics as the modern population of Armenia. The fixity of the Armenian type has been already noticed by anthropologists.

Besides these two foreign types the Assyrian monuments give the faithful portrait of the Negro; but the black African never was really included in the Babylonian Empire.

The Persian came late on the political scene; it is doubtful if we can point to a single specimen of the so-called Aryan type before Darius. From the time of this King the representations of Persians on the monuments and the seals become numerous. The old Persian type, as illustrated by the monuments of Persepolis and other Persian cities, seems to be what we recognise as the pure Greek type (fig. 15).

I wish in this paper to limit myself to the Assyrian and Babylonian monuments; I leave therefore aside the Egyptian representations, which have besides been so well classified by Mr. Reginald Poole. A few words about the Hittite representations are, however, indispensable.

Judging from the original monuments in the British Museum and the copies, more or less faithful, which I have examined, we have four different types, with a few variations—(1) one very near to that exhibited by the portrait of Marduk-nadin-akhe; (2) a Jewish (generally called Semitic) type; (3) a low type reminding us of the Jews of Lachish; and (4) the variable low type already noticed on the Assyrian monuments.

How are these varieties of types, and their distribution, to be accounted for?

The classics give us very little light. The Greeks had not in science a critical mind. Herodotus, for instance, our chief authority on Babylonian history, reports what he heard without attempting to control it scientifically; and like the rest of the Greeks, he always made a confusion between the Medes and the Persians,[1] but this mattered little, as the human race was for them divided into two classes—Greek and Barbarians; as long as a nation was not Greek it was of little consequence what it was. Diodorus Siculus was a conscientious compiler, but his chief authority on Babylonia, Ctesias, was a Greek who does not appear to have known Assyrian, and was often misled by his translators.[2] Strabo, if he had lived at a period not so late when all traces of the ancient empire of Babylonia were nearly stamped out, might have given us more trustworthy information, but his statements are only the far and faint echoes of the old traditions, and some of them can be understood only by the light of modern discoveries.[3] No doubt on account of the great influence exercised by the Ninevite Empire in Western Asia for centuries, the Greeks gave indistinctly to all the populations before the conquest of Cyrus, the name of Assyrians.[4]

We might expect to find more in Berosus, but as far as can judged from the fragments preserved from the work of this

[1] The Greeks called *Medic* their *Persian* wars. Æschylus in his "Persians" considers Cyaxares as the rightful predecessor of Darius.

[2] This is how is to be explained the fact that Ctesias gave for names to the Medic Kings their Persian translations (Oppert's "La langue et le peuple Medes"). By a similar process, I have found, is to be explained the names of the Assyrian Kings taken by the chronographers from the same author.

[3] So we find that Strabo made a confusion between the *Kaldu*, a tribe of Southern Babylonia, and a class (not a caste) of priests or sorcerers who at a later date took the same name.

[4] "Diod. Sic.," II, 2. The name of Syria is an abreviation of Assyria. In Diodorus Siculus we have the statement that Semiramis had an inscription written in *Syrian* characters (II, 15).

author, he merely stated that the population was mixed.[1] Justin is the only author who speaks of an early invasion of Scythians,[2] identified by the modern Assyriologists with the Akkadians. I will refer further on to this statement.

If we turn now to the statements contained in the Bible, we obtain no more than from the Greeks. It has been lately shown that the so-called ethnographical list contained in the tenth chapter of Genesis is really a geographical enumeration of the populations known to the Jewish author.[3] Prof. Sayce has shown that the primary division symbolised by Sem, Ham, and Japhet is taken from the colour of the skin; and it is evident that, once the distinction made, it was applied to the three great regions: *Ham*, the black, represents the South; *Sem*, the yellow, the Centre; and *Japhet*, the white, the North. By this process many yellow-skinned people are classed among the Hamites or black. The double principle underlying the classification has introduced confusion, and certain names are given as those of the descendants of Sem as well as those of Ham.[4] This classification according to the geographical position is also used by the prophets,[5] and nations having evidently no racial connection are brought together.

The Christian compilators and chronographers worked hard to reconcile the classic and biblical statements. The modern scholars, who treated the question before the discoveries of the Babylonian monuments, made further attempts with the same object. But as it happens sometimes, these attempts at conciliation only gave birth to a fictitious system. The greatest part of it has been exploded by the Assyrian discoveries, like the supposed primitive Aryan population of Babylonia. But some of it remains still, and has become a kind of scientific prejudice. I will allude only to one error, because some authors working on it have advanced the most astounding theories.

The Ethiopians of the Greeks were generally considered as the same as the Kushites of the Bible. Æthiops means black, Kush means black;[6] it was right so far. But it was not enough

[1] He says that at its origin Babylon was inhabited by a mass of people of various origins. Plutarch in the life of Romulus reports a similar tradition about Rome. In both cases it is evident that this is an acknowledgement of ignorance.

[2] I, 1, and II, 3. It is important to notice that in the eyes of Trogus Pompeius (abbreviated by Justin), the Scythians were not Tatars or Turanians, as generally admitted, but a nation related to, if not the same as, the Gauls.

[3] Lenormant in "Les Origines de l'Histoire," has brought together all what has been said on the question.

[4] For instance *Havilah* and *Sheba* are given twice. The author was no doubt also perplexed when the geographical position placed in the Hamitic group a population evidently connected with the Jews.

[5] Ezekiel xvii.

[6] This meaning might be doubted, but *Kush* is the Egyptian designation for the Negroes.

for the commentators. The Kushites were further identified with the Cossœans and Cassi of the classics,[1] they were made to extend into Asia, and brought as far as the Hindoo-Kush. A brilliant French scholar, the Baron d'Ekstein, made himself the historiographer of this supposed Kushite race, and reconstructed their very imaginary empire.[2] None of his suppositions or assumptions have been confirmed by the modern discoveries.[3] An ingenious author wishing to support this theory on philological grounds has gathered together all the geographical names having sounds more or less connected with *Kush*.[4] In this amusing enumeration is the name of the Hindu-Koosh, which, as we know, means "the death of the Hindoo," another name for "Hindu-Koh," "the mountain of the Hindu," on account of the deadly influence of the climate on the Hindoo traders crossing it; if in the name of this mountain *Koosh* were a proper name, the whole word would have no meaning. The same author wishing to connect these Kushites with some real populations, looks to the Akkadians as their representatives, on the ground of a passage of Pritchard misquoted by M. Maspero;[5] he does not seem, however, to have even understood M. Maspero, for this Egyptiologist considers the Kushites as the ancestors of the Semites, and classes the Akkadians under the convenient name of Turanian. The desire to find Ethiopians in Asia has provoked the most surprising aberrations. When M. Dieulafoy sent to Europe the photographs of the representation of Persian soldiers found by him at Susa, the hasty examination of the photograph gave the impression that these soldiers were black skinned,[6] though it was only the dark shadow on the photograph, and it was concluded that we had in this a representation of the famous Asiatic Ethiopians of Herodotus. But the chromolithograph accompanying the report of M. Dieulafoy upset the existence of the black Ethiopians of Asia; the representation is in colour and leaves no doubt as to the skin colour of these soldiers being not darker than that of the modern Persians.[7]

The amusing part of this theory is that these very Ethiopians

[1] In the classics we see already the germs of this confusion, though I am inclined to believe that there are interpolations in the text of Herodotus.

[2] In the "Athenæum Français" and "La Revue Archéologique."

[3] The v. 11–19 of chap. 10 of Genesis, which is taken as evidence of the Kushite empire in Mesopotamia, is very likely a later interpolation.

[4] "Oriental and Babylonian Record," No. 2. He forgot to give the names of several African populations which are certainly more Kush (black) than those he names.

[5] The passage of Pritchard's "Physical History of Mankind," vol. ii, p. 44, refers to the modern Nubian of Upper Egypt. Some authors went so far as to consider the Akkadian a black skinned population.

[6] "The Academy," July 24th, 1886.

[7] "Fouilles de Suse," campagne de 1885–6, Rapport, Paris, 1887.

or Kushites, if we are to believe Brugsch Bey, spoke a language related to neither Hamitic nor Semitic dialects, but a language related to the Nubian, consequently a Negro language.[1]

In conclusion it may be safely stated that the word *Kush* is the Egyptian denomination for the Negroes; that it was used by the writer of the tenth chapter of Genesis to designate populations of the south; that the Ethiopians of the Greeks were Negroes; and that it was extended to populations to the south of Egypt[2] (Abyssinians); but that the Kushites or Ethiopians *never* extended into Asia.

I must apologise for having given so much attention to this point, but lately this Kushite theory has been revived and threatens to invade classical books, and I wish to show that the whole of it is built upon assumptions supported by a few similarities of names, a few misunderstood passages in the classics and in the Bible, and a few distorted facts.

Before trying to explain how these populations came to be distributed, and which was their relationship, we may ask: what is a race?

Many classifications have been proposed to distribute the whole of the human race in groups, but we may say that they are all very unsatisfactory.

The most popular has been of course the philological classification, especially since the discovery of the relationship of the Indo-European languages. When philologists had separated the Aryan and the Semites, they failed to effect a satisfactory grouping of the other languages.

The anatomical classification is not much better, as we find in the same population long and short heads, fair and black hair, short and high stature, &c.

A moral classification has been proposed, but this is variable, as it is rather difficult to ascertain the intellectual capacities of a population.

The geographical appears in many cases the best, as the people group themselves often according to the conveniences of the land,[3] and it is a fact that in most cases the racial divisions answer to the geological constitution of the soil.

The inevitable conclusion is that all these data, insufficient when isolated, ought to be studied together, and all taken into account in order to determine the characteristics of a race.

[1] "Egypt under the Pharoahs," first ed., vol. ii, p. 273, *et seq.*

[2] The name of Kush or Ethiopia became so much associated with the country at the south of Egypt that it was used to designate Abyssinia; that is how the word Ethiopian is now used for the Semitic language of Abyssinia.

[3] In France after the invasion of the Barbarians the various populations settled themselves according to the natural geographical divisions.

There are no pure races, or rather we ought to acknowledge that a race is the result of crossings and of many influences.[1]

I have not spoken of the traditional or historical evidences. In many cases history enables us to determine the formation, and the development of the race; for instance, the modern nations of Europe have been formed in historical time. We must always proceed, however, from a starting point, and admit the existence of certain races from the crossings of which the new ones were evolved.

In the particular case of the races of the Babylonian Empire, the mythological traditions and historical documents enable us to trace back the development and distribution of the various types found on the monuments.

The first race, which inhabited all Western Asia, was the same short race, found everywhere, not only in Asia, but pretty well all over the world. Its characteristics, which have been noticed when speaking of the populations of Assyria, are more or less modified in various localities: but though this race is easily modified, it can always be recognised by its general features—short stature, round head, low retreating forehead, and prognathism. It is very likely that this is the race which the classics used to call *autochthones*, and which has received from modern writers the names of Turanians, Iberians, Ligurians, &c., all more or less misleading. As it appears to form the lower stratum, so to say, of the human population everywhere, I propose, until a better name is found, to call it the *Ground race*.

The presence of this race everywhere has not been specially noticed, though it is always mentioned in all ethnological papers of any importance. The type is not rare in Ireland,[2] and Barnard Davis, in his "Thesaurus Craniorum," gives characteristics which might be applied to the low race of Babylonia.[3]

It is found also everywhere in Scotland with the same characteristics.[4] In England proper it is rarer, but there are many evidences of its existence in former times.[5] I have noticed it myself in a great many parts of France, and also among Italians of the North or of Sicily. Mr. Hyde Clarke noticed it in Asia

[1] In a nation as in a family the various members show a certain likeness even if they differ anatomically. This general aspect, this *family likeness*, is the result of many influences and especially of moral and intellectual influences. The question of formation of new races in North America has been touched by D. Wilson in "Journ. Anthrop. Inst." vol. viii, p. 338, *et seq.*

[2] J. Beddoe, "The Kelts of Ireland," "Journ. of Anthrop.," No. 2, October, 1870.

[3] *Ibid.*, p. 118.

[4] H. MacLean, "On the Comparative Anthropology of Scotland," "Anthropological Review," vol. iv, p. 218.

[5] D. Wilson, "Physical Characteristics of Ancient and Modern Celt," "Anthropological Review," vol. iii, p. 52, *et seq.*

Minor, but in Asia, as in the north of Europe, it has not been distinguished from the Tatars or the Finns; in fact some writers gave to this race in England the name of Finnic.[1] I have not carried my inquiry into the American populations, but I have no doubt that this race would be found there.[2] Neither is Africa any exception; the Puls are everywhere accompanied by a low class of Negroes; and what has been called Helotts, tribes composed of people of a lower anthropological type, are not uncommon in Africa.

A few weeks ago when Prof. Flower read his paper on the Akkas, I was struck by the sketch of an Akka exhibited; it offers the principal characteristics of my ground race.

An important point to notice is that this race is everywhere found in an inferior social position, and it was equally so in the remotest age[3]; nowhere did it rise to the rank of a dominating or ruling race, but everywhere it accepted the yoke of the conquering tribe invading its land. It is the race of the land, and accepts every new master with a passive obedience. This explains why this race has no language of its own, for it accepts willingly that of its masters.

If I were inclined to theorise, I might suggest that this ground race is that of a previous geological period anterior to the age of the nobler races. But this would be nothing new, for it has already been advocated, and I leave it to others to decide.[4] The only fact which interests me is the existence all over Western Asia of a low primitive race easily recognised by its physical and intellectual characteristics; this is the ground race.[5]

The second race, which came to disturb the primitive inhabitants of Syria and Mesopotamia, was that commonly called Semitic from the language it spoke. I had myself adopted this name, but I must now reject it because this race had not the characteristics we are accustomed to attribute to the so-called

[1] See the paper of D. Wilson, "American Illustrations of the Evolution of New Varieties of Man," "Journ. Anthrop. Inst.," vol viii, p. 341.

[2] *Ibid.*, p. 60.

[3] Some biblical exegetes declare that the double creation of man in the first and second chapters of Genesis refers to the creation of two races distinct.

[4] M. Maspero ("Hist. Anc.," p. 131) seems to admit the existence of a population before the arrival in Mesopotamia of what he calls the noble races. But he falls into the same errors as most modern Assyriologists in placing the Akkadians before the Semites, though from the very evidences of the facts it is the contrary which happened. If the Akkadian invasion is to be identified with the Scythian one, the Semites certainly existed previously, for they were made tributary for 1,500 years according to Justin (II, 3). See my "Pre-Akkadian Semites" and "Origin and Development of the Cuneiform Syllabary" in the "Journ. of the R.A.S."

[5] *Ibid.*, p. 80, and all through the paper.

Semitic populations, taking for type the Jews. This race, as I have shown in a previous paper,[1] was originally from Africa, and acquired its special characteristics in Arabia Petra, where it seems to have made a long stay. For this reason I propose to call it *Sinaic*, from the name of the mountain *Sinai*, as the Caucasian is called from the Caucasus. This name is of course provisional. The Semitic tongue was certainly its language, but its physique must be looked for not among the Jews, Babylonians, Assyrians, and Syrians, but among the ancient Arabs as illustrated by the Assyrian monuments of which I have already spoken (fig. 10).

It has been noticed that by their peculiar geographical position the Arabs have preserved themselves comparatively purer than any other Semitic tribe,[2] and this appears to be true for the physique as well as for the language. From private enquiries of Arabs I find that the ancient type, just referred to, is the prevalent one in Arabia. This type, therefore, I take as that of my Sinaic race.

The third race which came to contribute to the stock of population of Babylonia, is that of the primitive Akkadians, and which I call provisionally *Gurian*. It is probable that the invasion of this people covered all Western Asia, that is, Babylonia, Assyria, and Syria[3]; at least, as we shall see, we detect its influence in all these countries. This race, after having affected the types of the other populations, and having contributed to form new races, appears to have melted away, and at later times is nowhere found pure.

A fourth race which contributed to the formation of new types is that represented by the two Armenian ambassadors, and which I propose to call *Nairic* from the name of Nairi, which designates in the Assyrian inscriptions the mountains of Armenia. As already noticed, the type appears at the time of Assurbanipal, when the Vannic language was still spoken. It is therefore probable that this Nairic race existed there in more ancient times, and it appears to have resisted all influences.[4]

[1] "Journ. Anthrop. Inst.," "Origin and Primitive Home of the Semites." Since this paper appeared the proofs in favour of my theory have increased tenfold; I have been able to connect the Semitic languages with those of Abyssinia (Agau, Falacha, &c. See "Notes on Assyrian and Akkadian Pronouns," "Journ. of the R.A.S.," vol. xvii, part 1). The Agaus of Lasta offer also the the same type as the Arabs of the Assyrian monuments, regular and well proportioned features, &c.

[2] See "Origin and Primitive Home of the Semites." Sayce, "Assyrian Grammar for Comparative Purposes." Palgrave, "Travels in Arabia."

[3] And perhaps also Asia Minor. The origin and primitive home of the Akkadians is unknown. Some suppose they came from Central Asia through Media (Sayce, *ibid.*, p. 13), others through Asia Minor (Pinches' "Guide," p. 4).

[4] The Armenian type seems to have a strong power of resistance, and maintained

These four races by their various crossings, which are in many cases attested by history, explain the existence of the various types exhibited on the monuments, and the formation of what I call new races.

The long-headed Babylonians are evidently the result of a crossing of the Gurian and the Sinaic.

In the type of Marduk-nadin-akhe we have a crossing of the Sinaic and the ground race.

In Assyria the Ninevite type appears to be the result of the crossing of the Gurian and Sinaic with a dash of Nairic. It may be that we have simply a modification of the Babylonian type (Gurian + Sinaic) through Nairic influence. It is from this influence[1] that the Ninevites have acquired their so-called Semitic nose. The influence of the Nairic tribes may have been exercised through early conquest or merely through contact and intercourse.

The low race of Assyria is the result of the crossing of the Assyrian with the ground race. And it is to be noticed that the curved nose of the Assyrian is visible in some specimens.

In Elam the mass of the population seems to have belonged to the ground race. It was subdued at an early period by the Gurians or Akkadians, who introduced their language, a dialect of which became the tongue of Susa, and brought in the variations which we notice in the type.

At a later date the Babylonian conquests and alliance brought in some modifications, especially in the higher classes; but it may be said that in Elam the ground race type predominates.

In Syria the mixture of races was, if anything, greater than in Babylonia. I will speak first of the Jews.

The very history of the people, as given by their sacred books, shows beyond any doubt, that they are not a pure race. The belief in the purity of the Jewish race is one of these prejudices which are repeated without trouble being taken to examine their accuracy. The Jews left Babylonia, under the leadership of Abraham, to escape persecution.[2] They went northwards and made a long stay near the mountains of Armenia; that is how they acquired the special characteristics, noticeable especially in the form of nose and chin of some of them,

itself through all accidents and influences (see "The Armenians of Southern India," by J. Shortt, "Journ. of Anthropology," 1870, p. 180).

[1] The partly Armenian look of the Assyrian was detected by R. Knox in his paper on the Assyrian marbles. "Transactions of the Eth. Soc.," vol. i, p. 146, *et seq.*

[2] It would require too much space to prove the point now, but the fact of such persecution is evident.

through Nairic influence.[1] Many travellers and anthropologists have noticed the likeness of Armenians to Jews: their moral characters are also very similar.[2] I do not speak of their common traditions, because these may be due to more modern intercourse. Once in Palestine, these Jews absorbed part of the native population. From Egypt they carried with them perhaps some Negrotic tribes, and thus was formed the type shown by the Jews of Lachish.[3] The Jews, however, always preserved two types, the one acquired by Nairic influence, and the other due to mixture with the ground race and other tribes of Palestine and Negroes from Egypt. The first type may be considered as forming the aristocracy; it is from this that would descend the Portuguese Jews, while the German Jews would come from the other.[4]

The Phœnicians, as far as can be judged, were a race different from the Jews. They also offered two types, the first one the result of a crossing of the Sinaic with the ground race, and the other the ground race modified by various influences—Negroes from Egypt, Gurians, &c.

The Hittites, judging from their own monuments, give a similar variety; the type reminding us of Marduk-nadin-akhe is the result no doubt of a crossing of the Sinaic and the ground race; the big-nosed race with developed prognathism, a mixture of Gurian with the same ground race.[5] The Nairic influence is also noticeable in some cases. But the Gurian element is larger, it would appear, than in Assyria or among the Jews. The Jews in fact have very little Gurian blood.

The Persians have a special type, and as they came late on the political scene they have had little, if any, influence on the population of Babylonia. Possibly before the conquest of

[1] An Arab Jew (judging from his type no doubt, from pure Arab descent, but converted to Judaism) exclaimed one day to me: "Where have the European Jews got their noses from!" The answer is simple; from Armenia.

[2] In many countries of the East the Armenians hold the same position and take to the same callings, as the Jews in Europe. See J. Shortt, *op. cit.*, p. 184, "with a general Jewish cast about their features," he says, speaking of the Armenians.

[3] Some travellers declare having found in Palestine a Jewish Negrotic tribe, which would have perpetuated itself through all the various dominations ("Trans. of the Eth. Soc.," vol. i, p. 223).

[4] If some people still believe in the purity of the Jewish race I would refer them to the paper of J. Beddoe in the "Trans. of the Eth. Soc.," vol. i, p. 222, *et seq.*

[5] This is the most common type. The Hittite types, *i.e.*, the types on the so-called Hittite monuments, have not been classed by anyone the ethnologist from point of view. They vary very much according to the localities where they are found. It is to be regretted that in many cases the copies of the inscriptions cannot be regarded as accurate types. All the inscriptions have been collected together in the work of Rev. W. Wright, "The Empire of the Hittites."

Cyrus some Persians had penetrated into Elam and given birth to hybrid specimens, but this is still doubtful. The Persian type, judging from the Persian monuments, remained very pure till the fall of the Empire.

There are two monuments of which I have said nothing, though they would be most important from an anthropological point of view, if we could have trustworthy copies of them. I mean the Buhustun inscription of Darius and the tomb of the same King at Naksh-i-Rustam. In the first, the portraits of the captive Kings brought before Darius must give some idea of the types of the countries. In the copies published we can only notice the special dress of each figure,[1] but the type is too much European to be trusted, and the variations in the drawings prove their inaccuracy.[2] The other monument would be more important still, for it gives, as is stated in the inscription, the representation of all the populations submitted to Darius, but in this case the copies cannot be trusted. In the drawing of Flandrin[3] we can detect the representation of the Negro, but for the other figures the type cannot be detected with certainty. I have been therefore obliged to neglect these two important documents.

Mr. R. Poole terminated his paper by expressing the wish that something might be done to secure to science accurate copies of the types on the Egyptian monuments. Thanks to the support of the Institute, his wish has been fulfilled. I will venture to express a similar wish with respect to the monuments I have just mentioned. Could not something be done to obtain accurate copies or casts of these representations?

Description of Plate VI.

Profiles from the Assyrian and Babylonian Monuments.

Fig. 1. Head of an early king or patesi, from a bronze head found at Tello by M. de Sarzec, and now in the Louvre.

Fig. 2. Head of a man of the lower class, of same period as fig. 1, from a rough outline drawing in intaglio on stone, from a fragment found at Tello by M. de Sarzec, and now in the Louvre.

Fig. 3. Portrait of Hammurabi, King of Babylon (about 2000 B.C.), from a stele now in the British Museum.

[1] The costume of the Sakian leave no doubt as to his nationality.

[2] It is sufficient to compare the copy given in the "Journal of the R.A.S." with that of Flandrin to be convinced that none are accurate.

[3] It would appear that the French artist had in view only the artistic side of the monuments, and the types of the figures cannot be trusted. All the monuments of the Persian kings have been photographed by the German mission, but so badly that the figures of the tomb of Darius cannot be even guessed.

Fig. 4. Portrait of Marduk-nadin-akhe, King of Babylon (about 1100 B.C.), from a boundary stone now in the British Museum.

Fig. 5. Head of a Babylonian soldier fighting in the ranks of the Ninevite army (about 650 B.C.), from a bas-relief in the British Museum.

Fig. 6. Head of an Assyrian king, from a bas-relief in the British Museum.

Fig. 7. Head of one of the Assyrian king's attendants, from a bas-relief in the British Museum.

Fig. 8. Head of an Assyrian of the lower class, time of Sennacherib, from a bas-relief in the British Museum.

Fig. 9. Head of one of the Armenian ambassadors visiting Assurbanipal during his campaign against Elam, from a bas-relief in the British Museum.

Fig. 10. Head of an Arab prisoner, time of Assurbanipal, from a bas-relief in the British Museum.

Fig. 11. Portrait of Te-umman, King of Elam, killed by Assurbanipal, from a bas-relief in the British Museum.

Figs. 12 and 13. Heads of Elamite soldiers fighting against Assurbanipal, from a bas-relief in the British Museum.

Fig. 14. Head of one of the Jews taken prisoner at Lachish by Sennacherib, from a bas-relief in the British Museum.

Fig. 15. Head of a Persian soldier, from the representation on enamelled tiles found by M. Dieulafoy at Susa, and now in the Louvre.

Discussion.

Mr. Pinches said that though one of the purposes for which he had attended the meeting was to hear Mr. Bertin's most interesting paper, yet he must admit that he could throw but little additional light upon the subject of the races of the Assyrian monuments. He had, it was true, paid attention to the question of the races delineated on the bas-reliefs, but he had no theory of his own to advance concerning them. Mr. Bertin had spoken in his lecture of the types of the Jews exhibited on the monuments, one—that of the tribute-bearers of Jehu—being a pure Semitic type, and the other—that of the captives of Lachish—being apparently much lower in the scale of intelligence. Now it was to be noted that examples of these types were to be met with at the present day, even that low type of the captives of Lachish, though naturally this was very rare. The tribute-bearers of Jehu, with their bent forms and their tribute (carried, in the case of some, in bags over their shoulders) reminded one of the now rather rare Jewish old clothes men, whom we used to see about the streets of London. It was true that the tribute-bearers were dressed differently, and wore boots with turned-up toes, but the type was practically the same. It was to

be noted, however, that the Arabic Jews, according to a gentleman of that race, from Bagdad, whom he knew, were of a different type from those of Europe generally, and did not show to a so marked degree the hooked nose which was their most prominent and distinctive feature. The Jew from Bagdad, to whom he referred, had a rather narrow face, a narrow but high forehead, and a nose which, though long, was only slightly hooked. Another very interesting type which Mr. Pinches had come across was that exhibited by the murderer Marks, a picture-frame maker with whom he had had dealings. Marks was a short man, rather swarthy, with high cheek-bones, broad nose, and curly hair. With but the very slightest modification—a mere rounding-off of the features—this was the very type of the captives of Lachish on the Assyrian bas-reliefs—Mr. Bertin's "low type."

The Assyrians, as represented by themselves, were certainly of a different type from the other Semitic races. They seem to have been of ordinary height, thick-set and muscular. The face was, as a rule, round and full. The eyes were large and overshadowed by beetling brows, well arched. The hair, both of the head, brows, and beard, was jet black. The nose, however, was, perhaps, one of the most interesting portions of their physiognomy, for it seems not to have been of the same shape as that of any other of the Semitic races, but to have had a longer depression between the eyes, and a more graceful rounding off at the tip. Judging from observations which he had made, Mr. Pinches thought that this feature of the Assyrians was the result of the intermingling of two races, one having a curved and the other a comparatively straight nose, in neither case, however, very long. It was such as might be expected from the union of, say, an Aryan and a Semitic race. In conclusion, Mr. Pinches said that he was of opinion that there was nothing so good as actual observation of the races and types now on the spot, and he recommended the subject to anyone who might have an opportunity of travelling in the East. He himself, staying constantly in England, could do but little in the way of comparison with the living representatives of those ancient races, but what little he had observed had been most interesting, and would not, he hoped, be without its value. In answer to a question by the President, Mr. Pinches said that he had not noticed, in the Armenians he had met with, that the upper lip was particularly short, but his attention had not been called so much to that feature as to the general type, which, in one case, coincided exactly with that shown on the bas-reliefs of the time of Assurbanî-âpli, or Assurbanipal, king of Assyria, 667–626 B.C.

Mr. A. L. Lewis referring to Mr. Bertin's statement that the figure of the King was usually more carefully executed than other figures, asked whether he thought the representation of kings were intended as portraits? This appears to be the case with many of the Egyptian sculptures and paintings (as shown by Mr. Petrie's photographs, &c.), but so far as he had himself observed there was

not much individuality about the Assyrian sculptures. Mr. Lewis also asked whether Mr. Bertin had compared the Assyrian representations with the Egyptian representations of the Khita, Arab, Syrian, and other tribes, against whom both nations had warred, and, if so, how far he had found them to correspond?

The AUTHOR in reply, said that the observations of Mr. Pinches tended, to a great extent, to confirm his explanation of the formation and development of the Babylonian, Assyrian, and Jewish, or so-called Semitic, races. The Armenian, or Nairic type, is most persistent; the Armenians themselves appear to be a non-Aryan population, who have adopted an Aryan language; their contribution to the Assyrian or Ninevite type is evident, but it is absent in the Babylonian. The Aryan race did not appear in Mesopotamia before Cyrus; therefore it cannot have had any influence on the formation of these types; what Mr. Pinches attributes to Aryan influence is due to that race, which is called in the paper Sinaic, and which must have been the Semitic-speaking population before the Akkadian invasion.

In answer to Mr. Lewis, the author stated that a careful examination of the Assyrian sculptures shows that the representations are, as in Egypt, undoubtedly portraits; if this does not appear at first sight it is on account of the strong family likeness of all the Ninevites. Mr. Bertin added that, in order not to unduly extend his paper, he had confined himself to the Assyrian and Babylonian monuments; he did so, especially as the question of the Egyptian representations had been already discussed by a competent Egyptologist.

MARCH 27TH, 1888.

FRANCIS GALTON, Esq., F.R.S., *President, in the Chair.*

The Minutes of the last meeting were read and signed.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From the AUTHOR.—The Tahiti Archipelago. By Baron Anatole von Hügel.

—— The Tuamotu Archipelago. By Baron Anatole von Hügel.

—— Sur la façon d'étudier une série de crânes d'après M. Topinard. Par M. le Dr. Victor Jacques.

—— Antropologia Fisica della Fuegia. Pel Prof. Giuseppe Sergi.

From the AUTHOR.—Evoluzione Umana. Pel Prof. G. Sergi.
From the SOCIETY.—Proceedings of the Royal Society. No. 263.
—— Journal of the Society of Arts. Nos. 1843, 1844.
—— Journal of the China Branch of the Royal Asiatic Society. 1887. Nos. 1 and 2.
—— Bulletin de la Société de Borda, Dax. 1888. Premier Trimestre.
—— Mittheilungen der Niederlausitzer Gesellschaft für Anthropologie und Urgeschichte. 4 Heft.
—— Mittheilungen der Kais. Königl. Geographischen Gesellschaft in Wien. 1887.
From the EDITOR.—Nature. No. 960.
—— Science. Nos. 265, 266.
—— Photographic Times. 337, 338.

Dr. E. B. TYLOR read extracts from a paper "On the Akkas," by Sir Richard Burton, K.C.M.G. The communication was illustrated by several photographs, including those of the Akka boys brought to Europe by Miani. Dr. Tylor, in commenting upon the paper, said that in the spring of 1881, four years after Sir Richard Burton's visit, he passed through Verona and called on Count Miniscalchi, in whose household the two "Miani" Akkas were living, evidently happily. They scarcely seemed to have grown, and the photograph (sent by Sir R. Burton) continued to give a good idea of their appearance. Dr. Tylor confirmed the description of their complexion as deep brown, negroid, quite unlike that of the Bushmen, with whom no one who had seen them could confound them. He brought away specimens of their hair, spirals of negro type.

M. HENRI SIRET, of Brussels, exhibited a number of illustrations of prehistoric antiquities found by himself and his brother, M. Louis Siret, during their explorations in the south-east of Spain.

The EARLY AGE *of* METAL *in the* SOUTH-EAST *of* SPAIN.

By MM. HENRI and LOUIS SIRET.

[WITH PLATE VII.]

SPAIN offers a great field for investigations in prehistoric archæology; and the scarcity of researches made in this country is the more to be deplored, inasmuch as we look to Spain, on account of her geographical position and of the natural riches of her soil, for the solution of many prehistoric mysteries as yet

unravelled. We cannot fail to perceive the part which this great country must eventually play in the solution of these questions, nor to lament that she should be so much behind other countries in the great scientific movement which has in recent years thrown so much light on primitive civilisation.

It fell to our lot to make a sojourn of eight years in the south-east of Spain. Our profession as engineers enabled us to traverse in all directions a large extent of the provinces of Murcia and Almeria. We took advantage of this circumstance to search for the remains of those who had inhabited the country before the historic period.

The success which rewarded our labours was beyond all expectation. We explored a strip of coast 75 kilomètres long, between Cartagena and Almeria, penetrating occasionally into the interior to a distance of 35 kilomètres from the shores of the Mediterranean.

In this district we explored about thirty stations. The discoveries we made show three perfectly distinct epochs. The first belongs to the *Neolithic* age. The second to a period of transition in which stone materials are in a great majority, although mixed with bronze ornaments and instruments of pure copper, while the third showed a civilisation of the most advanced type, characterised by special customs and new developments, stone being no longer employed except for restricted uses; copper being used more than bronze in manufacture of weapons and tools; the use of iron, however, was unknown, neither were there any coins or inscriptions. We will point out the most noticeable features of each of these epochs. The first offered us fifteen stations, situated on elevated plains.

The objects met with are found either on the surface of the soil, displaced in tilling, or at a slight depth in the bed of vegetable soil, mingled with carbonised remains.

One station, however, yielded us several centres of habitations marked by blackish soil filling a roughly polygonal space dug into the ground to a depth of about 40 centimètres, and sometimes surrounded by stones forming a rude wall. In this ground there lay various objects used by the ancient inhabitants and remains of their food.

In industrial products we must distinguish three classes—those of stone, those of bone and shell, and those of pottery. The stone objects are flint materials, polished axes generally of diorite, broken rings of marble, and perforated discs of stone and mill-stones for pounding the grains.

The worked flints are remarkably small in some of the stations: they are apparently flakes produced in the manufacture, but the intentional forms of the prehistoric tools, produced by

careful chipping, are easily observed in them. We see knives or flakes, both chipped and polished, nuclei, scrapers, piercers, and arrow-heads. These last are small flints of a more or less trapezoidal shape cut from the flakes. The flint is, probably, found in the country itself. The small tools have as yet been little studied; M. Cartailhac has found them in the Portuguese kjoekken-moedding; some have also been found in the dolmen of St. Laurence (Lower Alps), in the Abruzzi, and quite recently in Belgium. The polished axes are almost always of diorite, this stone abounding in the country. We possess certain series classified according to the state of workmanship; they are of all dimensions, from 4 to 30 centimètres in length.

The stone rings, of which fragments have been found, have been produced by rubbing; they were ornaments, bracelets, or pendants. The bone instruments consist of only a few pins.

The taste for personal ornaments was already highly developed among these peoples, as shown by numerous beads of steatite and shell, and by the scallops worn or perforated in order to make bracelets or pendants. The steatite beads are cylindrical in shape, or like a truncated olive, the perforation being effected from one side only, or from both.

Those made of shells have been obtained by dividing the valves of the mollusc with flint blades, and then making them flat by rubbing, and rounding off the edges, and lastly, boring the hole with flint awls.

An interesting discovery has enabled us to give an exact account of the process; we found in a little cave an urn of baked clay, elegant in form, though made in a primitive fashion; on its surface it bears ornamentation consisting of dots and lines; it is furnished with three flattened handles; in the earth which filled it, we found some entire sea-shells, fragments detached from other shells testifying to a commencement of work; small flakes of flattened shell, worn by rubbing, and more or less rounded; others already perforated; lastly, some beads completely finished and ready for stringing; there were in all about 500 beads, some finished and the rest unfinished. Next to this gradual series of ornaments in different stages of finish, we found flint nuclei, flakes that had served to divide the shells, and piercers for drilling the holes. The uninterrupted succession of the different stages, from the raw material to the finished bead; the implement and the flint block from which it had been extracted—all were represented here. The same vase also contained a beautiful hatchet made of white stone.

In order to make pendants, whole scallops perforated near the hinge were used, or pieces of the edge of this shell; we possess

more than thirty of these fragments shaped like crescents perforated at each end for suspension; about twenty entire bracelets obtained by rubbing away the centre of large scallop shells, and a large number of fragments of ornaments of the same class. Up to the present these ornaments have been very rare in collections. We possess, also, a very singular object of this period, made of carved slate; it is in the form of a cross.

We will not enter into details about the pottery; but will only say that we discovered a great inequality in the nature of the paste as well as in the care taken in making and firing the vases; we possess a specimen representing the art of pottery in its most primitive state; others, also rough, though better made; lastly, some pieces showing a finish altogether remarkable for those early periods.

The bead-makers' urn does not appear to be a product of native industry; it is too well made, and of an exceptional form which we have not found in the succeeding periods.

Stations of this period have also supplied us with some pieces of pottery ornamented with dots and lines and some few dots; fragments of copper implements; these last objects belong, probably, to the metallic age. It is inferred that the same sites must have been inhabited for a long time, and various civilizations may have followed one another; but those in which no traces of metal have been met with are regarded by us as indicating an earlier period than those which contain metal.

The mode of burial used at this period was by inhumation of several bodies in polygonal spaces enclosed by stones set in an upright position; the bodies were interred at a slight depth, with knives, arrow-heads of flint, and ornaments formed of steatite, beads, shells, or fragments of scallops; these ornaments have already been described.

We found seven of these graves; the number of skeletons varied from two to twelve or fifteen for each tomb; the bones were almost wholly destroyed; we possess, nevertheless, a skull, all the upper part of which is in good preservation.

Let us pass now to the description of stations of the transition age. We explored seven of them. Their topographical situation is like that of the preceding, from which they are distinguished by the following features:—

1. The construction of actual dwellings bounded by walls of stones cemented with earth, in which wood, reeds, and boughs played a great part.

2. The presence of ornaments of bronze and beads of hard stone.

3. Native metallurgy, smelting copper ore of the country in order to form tools in imitation of those of stone.

4. Co-existence of incineration with inhumation.

Thus, the man of that period constructed for himself a more secure and durable shelter; he protected it from the inclemency of the weather, from the wild beasts, and from his fellow-men, by actual walls which he raised with pebbles found in the torrents, and on mountain slopes; he bound these materials with earth; he covered his house with a roof formed of branches tied together with esparto, and overlaid with clay; and supported the roof with upright wooden props. We have been able to study these constructions even in their minutest details, thanks especially to the conflagration which destroyed them; the fire has charred the posts and esparto cords, has calcined the mud in which we see the perfectly distinct marks of branches and reeds, and has sometimes vitrified the soil of the dwellings in which we discover beds of rubbish. Our investigations brought to light numerous objects of daily use.

We give a brief list of the principal discoveries.

One hundred and fifty arrow-heads of flint, in which we find the greater part of the known neolithic types; several specimens are very well finished.

Two hundred flint flakes. These present nothing remarkable: several are chipped at the edges.

Forty axes of diorite, polished.

Many grindstones of various kinds of stone, used to pound the grain.

About one hundred pins of worked bone, two of which are furnished with eyes; five bone tubes intended to serve as bodkin-cases.

About ten horns of baked earth with a hole drilled at their extremity; clay-lumps slightly baked, oval in shape, pierced with holes in which one perceives the wear produced by the passage of a cord.

Numerous fragments of pottery, with handles and ears, perforated and not perforated, some whole vases showing a certain advance on the preceding age, although the wheel was not yet employed.

Fragments of pottery encrusted with copper scoriæ.

Cereals, of which the form is preserved by carbonisation.

Bones of animals, among which those of the goat predominate; the stag and the boar are also found.

Fifteen copper objects, formed of small pointed bars; one of these tools is still thrust into a bone tube which served as its sheath.

Three flat axes of copper (Pl. VII, figs. 6 and 7); one of

them presents an edge slightly widened by hammering, and constitutes the transitional form between the two others, reproducing in a slightly modified form the stone axes, and also the type of the flat celts, which we shall find in our third period.

This graduated series has seemed to us very important.

Two triangular arrow heads of copper, without tang or barbs.

A knife blade, likewise of copper, flat, without rivets or holes for them, which makes us think that it was simply thrust into a wooden sheath, or even held in the hand.

About ten kilos of copper scoriæ, and about an equal quantity of copper ore.

This ore was found in a heap, in the interior of a village; it was obtained from a copper bearing lode, situated a quarter of a league from the station; it is a very ferruginous carbonate.

Some little ingots of melted copper, irregular in shape.

Seven interments of this age have been examined, and both cremation and inhumation were employed. The ashes were deposited in urns of baked clay, having a flatter vessel for a lid; the urns themselves were placed in sepulchral chambers formed of slabs. The bodies that were simply interred had been placed by the side of the urns in the same graves. Near these remains we have again found oval bracelets of bronze, beads of bronze, limestone, and cornelian.

The changes which appear at this period must be attributed to a foreign influence; we believe that a trading people will be found to have brought to the neolithic men of the south-east of Spain the bronze ornaments, as well as the rite of cremation, and at the same time taught them the method of utilising the copper ores of the country. The metallurgic attempts which we discover would, therefore, be the first essays of the natives to cast copper instruments for themselves, in imitation of those of stone; which, however, are still in a greater proportion.

The art of reducing copper ores would not then be a discovery due to this civilisation, and with the first copper the first bronze appears.

The third epoch, which we have called the metal age, presents the following characteristics:—

1. Construction of villages on steep rocks, protected naturally by their situation, and artificially strengthened in weak places by thick walls, made of stones cemented with earth.

2. Discovery of the native silver of the Herrerias. This locality is situated in the centre of the zone where we found the most beautiful stations of this period, and where, a few years ago, silver was worked at a slight depth.

3. The use of the precious metal for manufacturing objects of ornament, and even weapons and tools.

4. General employment of bronze and copper, the latter being much more abundant than the alloy: the use of flint is now confined to saws, for which it is better suited than metal.

5. Disappearance of cremation. Interment effected in the floor of dwellings, a custom to which people resort on account of their great respect for the deceased and dread of an enemy; people wished to shelter the graves in which precious objects were deposited from the profanations of an invader, and the site of the villages was too small to make a cemetery apart.

We have discovered fifteen stations which we attribute to this period, and have made very important and successful excavations in ten of them. We have been able in this manner to collect very numerous data in regard to the construction and defence of these villages, and the funeral furniture of the graves excavated gave an enormous series of objects.

We met in the excavations two classes of objects: some come from the rubbish of the dwellings which have been often destroyed by fire; others were deposited in the graves. We give a list of the former, which we will describe very briefly.

Seven hundred saws of flint; they are coarse flakes, generally made of coarse-grained flint, which is very suitable for sawing; these tools are often very much jagged at the edges, which are generally glossy with wear. Some were held in the hand, others sheathed, for traces of a bituminous matter used for fixing the saw are still clearly visible.

Two hundred whetstones. We thus designate certain rectangular objects of schist, usually perforated at each extremity; their length varies from 5 to 20 centimètres. A good many of them show the characteristic wear of their use.

Forty polished axes of diorite; they are probably neolithic implements, collected and made use of by these tribes.

Several hundred mill-stones for pounding grain; we found several pairs of stones arranged exactly as they must have been employed.

About three hundred stones of various kinds, such as hammers, pestles, polishers.

A large quantity of carbonised leaves, barley-corns and wheat and various fruits.

Nine hundred tools of bone and ivory; the greater part are tapered pins, having served as bodkins or awls; there are also needles furnished with an eye, and instruments of unknown use.

A very large number of sea-shells, some of them pierced; limpets, Cardium, &c.

Several hundredweight of baked earth: we have given this name to lumps of clay, generally not much baked, rectangular or round, and 10 to 15 centimètres in diameter; they are drilled with one to four holes, which are worn away, almost always on one side only.

In our opinion they must probably have served for stretching threads in weaving occupations: we have pointed them out already in the preceding period.

Six moulds of sandstone for casting flat axes, knives, and bars, of which chisels, awls, &c., were made.

About twelve crucibles of baked earth, having the form of flat cups, very thick. Copper scoriæ and molten metal adhere to it. An analysis of one of these crusts proved that it was bronze. Some of the crucibles and moulds were collected into a sort of dark corner, covered with a rough arch of stones and earth.

Fifty arrow-heads of copper, the form of which varies from a simple flat lozenge-shaped plate to an arrow-head, tanged and barbed, about two hundred small round or square bars and some chisels of copper and bronze.

Knives and axes, of which we will speak again; these objects being more frequent in the burial-vaults.

Lastly, some fragments of pottery bearing ornaments of dots and lines incised; and innumerable pieces of wares of all kinds.

We will now say a few words about the burial-vaults. We excavated over 1,300 of them. The bodies were buried in the earth or in a naturally hilly spot, and were protected more or less by stones; or they were introduced into a cist formed of six slabs of freestone or pudding-stone; or more frequently they were interred in a large urn of baked earth.

To 1,300 burial-vaults there were 150 holes, 150 cists, and 1,000 urns. The body was generally contracted so that the knees were drawn up to the chin; thus it is very exceptional that the tombs are more than one mètre long. They were arranged in this way in order to save ground.

It is likewise for practical reasons that urns were more employed than cists. When once the potter's art had obtained the development that we have discovered at this period, it may be believed that urns of baked earth were preferred to the cists made of slabs; as being easier to make on the spot, easier to close, and taking less room.

The form of the large urns is uniformly the same, and resembles that of an egg with the large end cut off and replaced by a funnel-shaped mouth more or less pronounced (Pl. VII, fig. 3).

Those containing skeletons of children are probably domestic vessels which have been adopted for sepulchral use. They are

of various shapes. The smallest are not more than 20 centimètres high. The particulars we have gathered concerning these urns show clearly that they have been made without the help of the potter's wheel. The paste is generally more or less of a dark red colour and very well baked. Many small fragments of stone are noticed in it, introduced designedly in order to prevent shrinking.

The largest of these tombs are 1·05 mètres long, 60 centimètres in diameter in the centre, and 50 centimètres at the mouth. They are almost always placed horizontally, a slab of sandstone, schist, or gypsum being put at the mouth to close them. In certain cases this closing has been effected by means of another urn attached to the first mouth to mouth, or by means of a smaller vase.

The burial-places were almost always filled with earth, the urns had become broken, and the pieces were sunk down in the earth.

In some cases, however, the tomb was entire; the urn, although broken, preserved its form, the pieces having remained in their place. The lid had been hermetically sealed, and by removing it we were enabled to see the burial-place just as the ancients had arranged it.

The funeral furniture consists of tools, castings, ornaments, and bones of animals. We will say a word about each of these series of objects.

The arms and the tools are more often of copper than of bronze, although those of bronze have the same shape as those of copper. Beside the men they placed a flat axe, a halberd or a sword, and a knife or dagger; beside the women a knife and a bodkin. The flat axes have a rather wide blade, the sides are curved. We found about seventy, the specimens showing only a small rim obtained by hammering the side. The three hundred specimens of knives or poignards are flat blades furnished with rivets for fixing to the handle (Pl. VII, fig. 5). Their length varies from 4 to 22 centimètres. There are often some woody filaments, or fibres, of the latter preserved by means of incrustation with copper salts. The same impregnation has preserved pieces of linen-cloth which we have often found adhering to the weapons. The fibres which remain of the handle are parallel to the length of the blades or slightly oblique. The rivets are generally of the same metal as the blade. Their number varies from 1 to 10. We possess eight knives with silver rivets.

We have called by the name *halberd* a weapon of a particular kind. Its length is the same as that of the poignards, but the base is wider; the rivets are stronger; they have, besides, a strong central rib, and when fibres of the handle are preserved

they are perpendicular to the length of the weapon, which shows a method of sheathing quite distinct from that of the knives (Pl. VII, fig. 4).

We possess about a dozen of them. The swords are blades 55 to 65 centimètres in length, of the same shape as the knives; they are of bronze. Of these we found three.

The borers are small bars, rounded and pointed at the extremity, square and flat at the other end, on which fragments of woody fibre are sometimes found. We have several borers of which the wooden or bone handle is still well preserved. The graves have yielded two hundred borers.

Generally speaking, the metal objects are greatly changed. The knives and ornaments no longer possess any metal; all have been changed into an oxide or a carbonate. The axes have resisted better, owing to their thickness.

We shall say but a word or two on the pottery, so abundant and so beautiful, found in the sepultures. They are of several distinct types. The paste is generally black, and through it are scattered silvery fragments of mica. It bears the traces of frequent and careful polishing. The pottery is executed with a very remarkable perfection, although without the aid of the potter's wheel. The forms are simple, yet elegant. We may especially cite the cups with feet or pedestals (Pl. VII, fig. 1). This form is new in the first bronze age. We possess very beautiful and numerous specimens. These cups are often broken. We have often met in the same tomb a larger and a smaller vase. Altogether we have collected over 1,000 entire pieces of pottery in the sepultures of this period.

The ornaments are of various kinds: rings, bracelets, ear-rings, necklaces, and diadems.

The bracelets, rings, and ear-rings are formed of metal wire, more or less thick, rolled round once or one and a-half times for the bracelets and rings, and as many as eight times for the ear-rings; these wires present a round section and are not at all ornamented.

We have five hundred of these ornaments in copper, three hundred in bronze, eight hundred in silver, and eight in gold; among these last there is a bracelet weighing 114 grammes.

The diadems are all of silver; two of them are made of a simple ribbon, 2 to 5 millimètres in width, going round the head; four others have on the front a flower or ornament made of thin plate, a good idea of it can be got from fig. 2, Pl. VII. One of these diadems was found on the skull of the woman who wore it; lastly, the seventh is a metal band 30 to 32 millimètres in width, the two ends overlap to the extent of 18 millimètres, one end is cut square, the other rounded; they are united by two

copper rivets; the circumference of the diadem is 537 millimètres; over the whole of its surface there has been traced an ornamentation consisting of a series of embossed dots made by pushing the metal outwards.

The necklace beads number about 4,000, the greater part of which are made of ordinary serpentine; there are others of precious serpentine, copper, bronze, silver, gold, ivory, earthenware, and wood. The necklace beads and the ornaments in general were richer in the women's tombs than in the men's, and those of the young women were richer than those of the old ones. The bones of animals placed near the deceased are almost always shin-bones of oxen; there are, however, also some graves with goats' bones. These remains of food clearly point to the belief in a future life. About five per cent. of the total number of burial places contained two skeletons, one of a man and one of a woman, their interments being probably successive[1] not simultaneous.

It can be seen from this brief sketch what progress civilisation had made; it had, however, to some extent freed itself from the foreign influence observed in the preceding period, and had come back to an independent existence; this is seen by the return to inhumation of the dead, by the absence of beads of hard stone and by the relative decrease in the number of bronze objects, compared with that of copper.

We think, therefore, that these people attained of themselves to the brilliant social condition we have shown, and that the discovery of native silver was the motive which impelled them to construct real entrenched camps within which they erected their dwellings; having found these riches they had to protect the soil against covetous invaders. Intercourse and exchange with the importer of bronze must therefore have been very limited. This importation is extremely probable, since there is no tin ore in this country.

The knowledge of silver by no means rendered necessary the metallurgy of lead and its desilverisation.

It is on account of the exceptional circumstances of this rich

[1] We have been able to collect eighty entire human skulls and a good number of limb bones. Dr. Jacques, Secretary of the Anthropological Society of Brussels, has studied these bones with great care; he distinguishes in the skulls four groups. The first belongs to the race called the Cro-Magnon race. The second presents much analogy to those which MM. de Quatrefages and Hamy class in their third fossil race, and especially with the Furfooz skull No. 2, and some skulls of Grenelle; finally, the fourth exactly recalls the Ligurian type of Nicolucci. The three first groups have been recognised by the very few authors who have applied themselves to the ethnology of the Peninsula, and are found agair, besides others, amongst the Basques of Zarnus, and St. Jean de Luz of Broca.

country that we find this beautiful metal in the hands of a people who hardly knew anything of bronze, and were ignorant of writing and the use of iron.

It is none the less true that we see them in possession of a highly organised civilisation, of which their respect for the dead gives a true index.

The development of this civilisation could not have lasted long: it was destroyed by an enemy about whom our excavations have taught us nothing; we have only discovered the ruins.

The third period of which we have spoken cannot have lasted very long; the weapons and implements would otherwise have been brought to a greater state of perfection. From calculations, based on mortality, the duration must have been from 100 to 300 years.

If we examine the other discoveries recorded in the Iberian Peninsula we find some resemblance between them and those of our two first periods; but the region in which the remains of our third civilisation have been found appears very limited. The native silver mines of the Herrerias are in the centre of this region, as one might expect. Besides our discoveries some others have been made in this country, by means of which we can trace the boundaries actually known of the region where these people had settled. Thus we find the following boundaries: on the east, the Mediterranean; on the north, Cartagena and Puebla de Don Fadrique; on the west, Caniles Alcúdia; on the south, Almeria.

Outside Spain we find some curious resemblances between the objects of our collections and those of M. Schliemann's discoveries at Hissarlik. This is the nearest comparison we can institute.

Description of Plate VII.

Fig. 1. Earthenware cup on foot, representing a type not previously recognised among remains of the first bronze age.

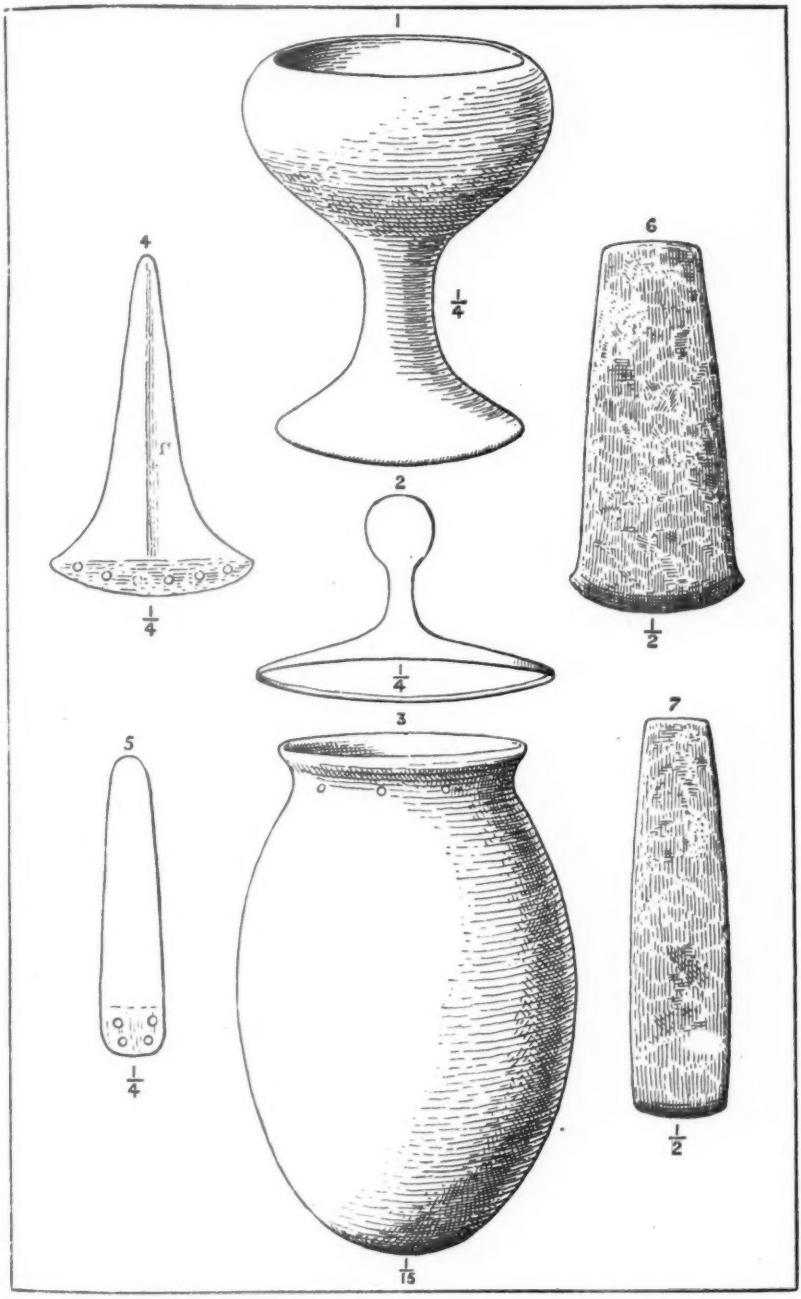
Fig. 2. Silver diadem with frontal ornament. A similar diadem was found round the skull of a female in one of the interments.

Fig. 3. Oviform sepulchral urn in coarse pottery, for containing the dead.

Fig. 4. Bronze halberd, with six silver rivets.

Fig. 5. Bronze poignard, or knife, with rivets.

Figs. 6 and 7. Flat copper axes of the transition period between the neolithic and the early metal ages.



PREHISTORIC ANTIQUITIES FROM THE SOUTH-EAST OF SPAIN.

APRIL 10th 1888.

FRANCIS GALTON, ESQ., M.A., F.R.S., *President, in the Chair.*

The Minutes of the last meeting were read and signed.

The following presents were announced, and thanks voted to the respective donors :—

FOR THE LIBRARY.

From the AUTHOR.—Notes and Observations on the Kwakiool People of Vancouver Island. By George M. Dawson, D.S., F.G.S.

—— Die Physiognomik. Von Hermann Schaaffhausen.

From the U.S. BUREAU OF ETHNOLOGY.—Perforated Stones from California. By Henry W. Henshaw.

—— The Use of Gold and other Metals among the ancient inhabitants of Chiriqui, Isthmus of Darien. By William H. Holmes.

—— Bibliography of the Eskimo Language. By James Constantine Pilling.

—— Bibliography of the Siouan Languages. By James Constantine Pilling.

—— Work in Mound Exploration of the Bureau of Ethnology. By Cyrus Thomas.

From the ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.—The Scottish Geographical Magazine. Vol. iv. No. 4. April, 1888.

From the ANTHROPOLOGICAL SOCIETY OF WASHINGTON. The American Anthropologist. Vol. i. No. 1. January, 1888.

From the ESSEX FIELD CLUB.—The Essex Naturalist. Vol. ii. No. 3. March, 1888.

From the DEUTSCHE GESELLSCHAFT FÜR ANTHROPOLOGIE, ETHNOLOGIE, UND URGESCHICHTE.—Correspondenz-Blatt. 1888. Nr. 2–4.

From the SOCIETÀ ITALIANA DI ANTROPOLOGIA, ETNOLOGIA, E PSICOLOGIA COMPARATA.— Archivio per l'Antropologia e la Etnologia. Vol. xvii. Fas. 3.

From the ASSOCIATION.—Proceedings of the Geologists' Association. Vol. x. Nos. 3, 4.

—— Journal of the East India Association. Vol. xx. No. 1.

—— Journal of the Royal Historical and Archæological Association of Ireland. Vol. viii. Nos. 73, 74.

From the SOCIETY.—Journal of the Society of Arts. Nos. 1845, 1846.

—— Proceedings of the Royal Geographical Society. Vol. x. No. 4.

—— Proceedings of the Asiatic Society of Bengal. 1887. Nos. 9, 10; 1888, No. 1.

From the SOCIETY.—Journal of the Asiatic Society of Bengal. Nos. 276, 278–280.
—— Bulletin de la Société Impériale des Naturalistes de Moscou. 1888. No. 1.
—— Bulletin de la Société Neuchateloise de Géographie. Tome iii, 1887.
From the EDITOR.—Journal of Mental Science. New Series. No. 109.
—— Nature. Nos. 961, 962.
—— Science. Nos. 267, 268.
—— Photographic Times. Nos. 339, 340.
—— American Antiquarian. Vol. x. No. 2.
—— Revue Scientifique. Tom. xxxv–xl. Tom. xli, Nos. 1–14.

CAPTAIN STRACHAN exhibited a Papuan boy, and described the circumstances under which he was brought from New Guinea.

The SECRETARY read a paper on "The Early Age of Metal in the South-East of Spain," by MM. Henri and Louis Siret, which is printed above at p. 121.

Mr. J. ALLEN BROWN exhibited a collection of small stone implements, and read the following paper:—

On SOME SMALL HIGHLY SPECIALIZED FORMS *of* STONE IMPLEMENTS, *found in* ASIA, NORTH AFRICA, *and* EUROPE.

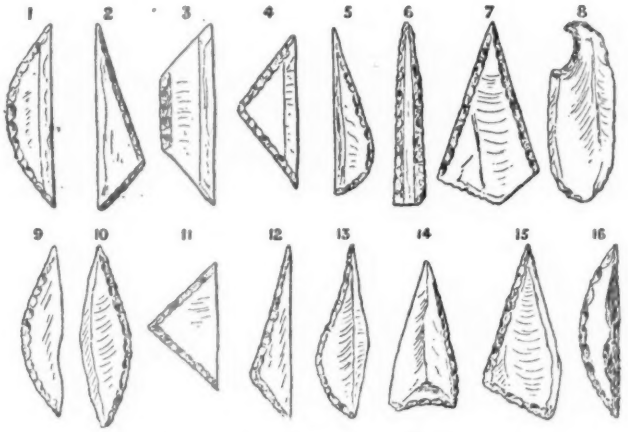
By JOHN ALLEN BROWN, F.R.G.S., F.G.S., &c.

DURING the past five or six years a large number of small implements formed of agate, jasper, chert, and flint have been found in India, Syria, Southern Europe, Africa, &c., to which I wish to call attention for the purpose of ascertaining whether they have been met with in the British Isles and other places not previously noticed.

These diminutive instruments, so highly specialized in form, have created some interest among French anthropologists, and they have been described and figured in papers and periodicals abroad, but notably in M. G. de Mortillet's very interesting and important magazine of anthropology, "L'Homme;" they have not, however, met with the attention in this country I think they deserve, nor have they, as far as I am aware, been noticed in British scientific serials.

These instruments are of various forms which are generally found associated together, crescent, quadrilateral, scalene and

obtusely triangular, while others may be described as thin, acute knifelets, very small spoke-shaves, &c. They rarely exceed five-eighths of an inch in length, and those of crescent shape very neatly worked on the convex side, and the long scalene and obtuse angle forms, as well as many of those of trapezoid shape, are often little more than half that size, as shown in the following figures.



SMALL STONE IMPLEMENTS. (*Natural Size*).

Figs. 1 to 8, from caves in the Vindhya Hills, Baghelkand, and Bundelkand, Banda, &c.
Figs. 9, 11, 12, 13, and 14, from Coincy L'Abbaye (Aisne).
,, 10 and 15, from Hédouville (Seine et Oise).
,, 16, from Bethlehem, Syria.

The whole series bears the impress of the same thought and intention on the part of the fabricators as shown in the definiteness which distinguishes the various forms, by the adoption of the same model and mode of producing them.

Now when, as will be seen, these results are noticeable in specimens obtained in different localities, in a definite direction, we are justified, I think, in assuming, not only that they indicate a peculiar industry, whatever the purposes may have been for which they were fabricated, but in suggesting that an industry so distinctive in character, probably represents the work of a particular race, or wave of population which has migrated westward in the direction in which they have been found.

These interesting instruments were, I believe, originally discovered by Mr. A. C. Carlyle, late of the Archæological Survey of India, in the wild country of the Vindhya Hills, Central India, and he subsequently found them in other localities. A very

interesting collection of these objects with others of Palæolithic and Neolithic age, and early Buddhist relics was exhibited by him last year at the Royal Albert Hall,—the result of twenty-five years of exploration and hard service.

Mr. A. C. Carlyle found all the varieties of these small implements by hundreds in caves and rock shelters in places very difficult of access to the ordinary traveller, also below the northern scarps of the Vindhyas in Bundelkhund, Mirzapur District, and Riwa. He met with similar forms (crescents and others) rather larger and much more coarsely worked south of Kalinjar, in the nullas of the Paisani River, Naro Hill, and Patar Kachâr, and also on the low ground of the Banda District, from which latter locality Mr. J. H. Rivett-Carnac also obtained them. The small instruments are described by him and figured in a paper entitled, "Stone implements from the North-West Provinces of India," Calcutta, 1883.

The most perfect specimens, according to Mr. Carlyle, were found in the caves and rock shelters alluded to, where they occurred in abundance associated with larger chipped implements, flakes, and small cores of agate, &c., and under such conditions as to indicate that these sites had been inhabited for a long period, and that they had been occupied as working places for the manufacture of these small instruments and others. It is worthy of note that polished or ground implements were never found associated with them.

I may here mention that the late Colonel Ryder found a large number of small spoke-shaves (fig. 8) with small knives, cores, &c., of a similar character on the southern slopes of the hills overlooking the Narbudda, near Jabbalpur,[1] of which examples are in my collection; it is noticeable that these objects were found on the southern slopes of the hills, which are often composed of alluvium, the northern flanks being now preferred by the people on account of the heat. It has been conjectured that these small cores when worked up to a point were used when fitted into bamboos, and secured with gum or other substance, as spears.

More interest, however, is attached to the caves and rock shelters at Marahna Pahâr (Vindhyas) from the fact that very rude pottery, roughly and simply ornamented by strokes, perhaps produced with small flakes, rubbed down pieces of "Geru," or red hæmatite from the laterite deposits, and also rounded stones for pounding this mineral into a pigment, were found associated with the instruments.

[1] See "Some discoveries of worked flints near Jubbalpur in Central India," By Dr. J. Evans, "Proc. Soc. of Antiq.," 2nd Series, Vol. III.

This fact is curious as it suggests the employment of some of the small sharp knifelets for tattooing, and that the paint made from the hæmatite may have been used to colour the punctures and incisions.

Mr. Carlyle informs me that some few of the rudest aboriginal tribes of the wildest central parts of India still practise a modified and partial sort of tattooing, but only with deep blue or other dark or grey colour but never with red. Hindus use red and white, and sometimes yellow colours superficially without incisions which will wash off, as religious sectarial caste marks on their foreheads; these are the only instances, as far as I can learn, where such pigments are used either for embellishment or religious symbols in India now.

On the walls of some of the caves at Marahna Pahâr were rude drawings of men and animals painted in red, which were copied by Mr. Carlyle. These representations are of the usual child-like character which is seen in similar pictographs of savage races; they may be, judging from their appearance, the earliest efforts of these cave dwellers to write their thoughts.

The upper stratum of the caves contained the crescents, trapezoids, triangular forms, and thin delicate knifelets, but beneath it, separated distinctly by a line of stratification, were much older implements, and of much larger size, formed of indurated sandstone, quartzite, and chert.

Small crescent and other implements of exactly the same types were found by Mr. Carlyle in some grave mounds excavated by him, showing that probably the same people raised them who made the rude uncouth red paintings or pictographs in the caves and rock shelters.

These peculiar instruments are different in shape and make from the usual objects of Neolithic work. They have been described in an article by M. Adrien de Mortillet ("L'Homme," 1884, p. 145), who says that the crescent instrument, the most marked form, has been found at Tunis by M. G. Belluci, and that the French soldiers obtained a quantity of them at Gabes. Mr. Haynes found them and some of the other varieties in Egypt, in fact they have been met with in all the north of Africa.

They are not rare according to M. A. de Mortillet in Italy, and the rhomboidal flints of M. de Chierici he believes belong to the same class.

Among the flint implements obtained by Sir Richard Burton from Bethlehem, and figured and described in his paper, "On Anthropological Collections from the Holy Land ("Proc. Anthro. Inst.," No. 1, 1872) is the exact counterpart of one of the crescent instruments from India, and other places to be mentioned: fig. 16 was found at Bayt Sahhr, a village a short

distance from Bethlehem, associated with worked knife flakes, &c., all of which appeared to be discoloured by exposure or other causes, "on a ledge of chalky limestone with a drop of rock, and a bed of garden stuff to the north, while behind, or southwards, are steps of higher ground over which runs the rugged road to Bethlehem." Dr. J. Evans says of this group of implements, in which opinion I concur, that the same forms are found "among the refuse heaps of the south of France, and unless the associated fauna prove that such cannot be the case, they are doubtless of Neolithic age, and probably of much the same date as the instruments of similar character from Sinai."

It is very remarkable that small flint implements identical in form with the crescents and others have also been found in France (Languedoc and Gascogny). They have been described by M. A. de Mortellet from Hédouville (Seine et Oise) figs. 10 and 15, and also from near Coincy L'Abbaye, Canton de Fère en Tardenois (Aisne), figs. 9, 11, 12, 13, 14, where they were found by M. Emile Tate; these are all figured in "L'Homme" (of 25th August and 25th November, 1885).

The series from Coincy L'Abbaye it would be difficult to distinguish from those discovered by Mr. Carlyle in the caves and rock shelters of the Vindhyàs.

Neatly worked triangular instruments of similar manufacture and others are now in the Musée Broca, collected by M. Fortoul from the dolmen of St. Laurent (Basses Alpes), and M. Cartailac has found in the kjoekkenmoeddings of Portugal small flint implements of trapezoidal form like No. 3.

Lastly, M. Méréjkowski discovered near Kizilkoba in the Crimea a working place, where most of the varieties of these curious small instruments were well represented. (See "Premières recherches sur l'age de la pierre en Crimée en Russe," St. Petersburg, 1880).

It is evident, I think, that these peculiar types of implements are of Neolithic age; the commencement of that period and the conclusion of the Palæolithic shows no definite line of demarcation in India. We shall probably, sooner or later, come to the conclusion that there is really no hiatus between them in Southern Britain: in fact no very good reason has been given why there should be a gap. Recent discoveries show that some of the later Palæolithic forms closely approach earlier Neolithic types, as shown by many of the specimens found at Cissbury, and in the upper deposits of some of the caves; we only require more evidence of the fauna which continued into early Neolithic times in Southern Britain to complete the bridge as Mr. Carlyle believes is the case in India, where, he says, the Palæolithic and Neolithic periods are connected, as far as the types of the

implements go, by certain forms which appear to be intermediate and to which he has applied the term Mesolithic.

In this connection it is worth noticing that two trapezoidal Palæolithic implements, about $1\frac{3}{4}$ inches in length, were found in one of the upper strata of cave earth in Kent's Cavern. They are described, and one of them is engraved, in Dr. John Evans elaborate work ("Ancient Stone Implements," fig. 400). He says, "both the two sloping ends and the short side are worn by use, while the long side is unscathed," and he tells us he is not aware of this form of instrument having as yet been noticed elsewhere.

Although some of the triangular flints may have been used as arrow points, many of them are too small for that purpose, and they differ in many respects from Neolithic arrow-heads. Moreover the less highly finished triangular chipped flakes of larger size, similar to those generally believed to have been used for pointing arrows are associated with them in India and elsewhere.

It is not easy to determine the purpose for which the small crescents, trapezoids, scalene triangular, the similar form rounded at one end (figs. 5 and 13), and the long, thin, delicate knifelets, &c., all which are often beautifully worked with minute secondary chipping, were made.

It has been suggested that some of them may have been employed for tattooing. There must have been other uses, however, to which the other forms were applied, and the large number found in certain localities in India, all worked on the models of the varieties shown in the drawings, points to the general employment of these instruments among the tribes who used them, and of the continuous demand for these objects.

Whatever the purposes for which they were fabricated by the Indian cave dwellers and others, they clearly represent a special kind of industry, and it may ultimately be shown that they are the work of a particular race which, emanating from Central India, migrated and spread out in a north-westerly direction through Syria to the Crimea, along the north and south shores of the Mediterranean to France and Portugal, and is not improbable that they will be found on the surface or in the latest river beds of Britain.

APRIL 24TH, 1888.

FRANCIS GALTON, Esq., F.R.S., *President, in the Chair.*

The Minutes of the last meeting were read and signed.

The election of GEORGE HODDINOTT, Esq., of 19, Nassington Road, Hampstead, was announced.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From A. L. LEWIS, Esq.—The Antananarivo Annual and Madagascar Magazine. No. 4, Christmas, 1878.
From the AUTHOR.—Ueber die Zeit des ersten Auftretens der Buche in Nord-Europa und die Frage nach der Heimath der Arier. Von K. Penka.
From the MITCHELL LIBRARY, GLASGOW.—Report, 1887.
From the YORKSHIRE PHILOSOPHICAL SOCIETY.—Annual Report for 1887.
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—— Proceedings of the Society of Biblical Archæology. Vol. x. Part 5.
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—— Science. Nos. 269, 270.
—— Photographic Times. Nos. 341–343.
—— Revue Scientifique. Tome xli. Nos. 15, 16.

The following paper was read by the Secretary:—

CAMBRIDGE ANTHROPOMETRY.

By JOHN VENN, D.Sc., F.R.S.

A few years ago, Mr. Galton instituted a small anthropometric laboratory at South Kensington, during the time of the International Health Exhibition. The principal results of the measurements carried out there, and which embraced 9,337 persons, were published in the "Journal of the Anthropological Institute," for February, 1885; and in June, 1885, Mr. Galton

was appointed Rede Lecturer at Cambridge, and chose as the subject of his discourse, the nature, principles, and objects of the quantitative estimate of some of the less commonly, and less easily, measured of the human faculties. In order to perpetuate such interest as was excited by the results of this lecture Mr. Galton presented a set of instruments, similar for the most part to those which had been in use for South Kensington, to a small Committee at Cambridge, for corresponding use there. Some difficulty was experienced at first in choosing a suitable room in which the measurements could be carried out, as the University has but little available space, and unless some room could be found the position of which should bring the subject prominently under the notice of the students, no very extensive results could be hoped for. At first the committee-room of the Union Society was put at our disposal, but this was not very long available, as some demur was made by the authorities there to the use of the room by undergraduates who were not members of the Society. After a time the library of the Philosophical Society, situated in the centre of the new museums and lecture rooms, was secured, and the measurements were taken there by Mr. White, the Librarian of the Society. The bulk of the measurements here discussed were taken by him.

As regards the instruments themselves little need be said, as most of them were fully described by Mr. Galton ("Journ. Anthrop. Inst.," February, 1885). They consisted of the following:—

1. For measuring keenness of eye-sight. This assigns the distance to the nearest odd number (up to 35 inches) at which "diamond type," *i.e.*, that of the ordinary little shilling prayer-book, could be read. The power of each eye was separately determined. (In the present case diamond *numerals* were used).

2. For measuring strength of "pull." The essential part of the instrument consists of two handles connected by an elastic spring. One is held in each hand, and they are then drawn apart as far as possible, by an action resembling that of an archer drawing a bow. The particular exertion of force thus called for is, I apprehend, an unusual one for most persons at the present day. It produces the feeling, if I may judge from my own experience, of acting under very awkward circumstances, and at considerable mechanical disadvantage. Perhaps the only familiar exertion of force which at all resembles this is that which we have to put out in drawing the cork from a bottle; but in this case the hands are held much nearer together.

3. For measuring strength of "squeeze." The essential part

consists of two bars, some three or four inches apart, separated by a spring. They are squeezed together as close as possible and the result read off on a diagram. The power of squeezing thus possessed by each hand is indicated separately in our results. The instrument cannot be regarded as very accurate, since the effective range through which the muscles of the hand can thus work is but small. For purposes of intercomparison, where the same instrument is in use, this does not much matter, but one would have to be cautious in comparing the results obtained at Cambridge with those previously obtained by a different instrument at South Kensington.

4. Head measurement. Two instruments made by the Cambridge Scientific Instrument Company. One measures the maximum length and breadth; the other measures "the maximum height above the plane that passes through the upper edges of the orbits and the orifices of the ears." The magnitudes are assigned to the tenth of an inch.

5. Breathing capacity. "A spirometer is used, made by a counterpoised vessel suspended in water. When the air is breathed into it through a tube, the vessel rises, and the scale at its side shows the number of cubic inches of displacement. The person to be tested fills his chest and expires deeply three or four times for practice; then, after a few seconds rest, he tries the spirometer," as described by Mr. Galton in the South Kensington records.

6. Height without shoes. This is estimated from the measurement in shoes, deduction being made for the measured thickness of the heels, to the tenth of an inch.

7. Weight. This is estimated, in ordinary indoor clothing, to a quarter of a pound.

Altogether, therefore, it is seen that eleven distinct measurements are made and recorded of each person.

When a sufficient number of results had been obtained to furnish a fairly stable basis of experience I was requested by Mr. Galton to undertake an analysis of them, and a comparison of their general outcome with that of those obtained by almost identical instruments at South Kensington. Before proceeding to do this one or two general remarks must be made. In the first place, then, though the actual number of results may not be very large, they are really, for purposes of statistical accuracy, much more extensive than they may seem to be. This is owing to the homogeneousness of the class of persons here represented. At South Kensington more than 9,000 persons were measured; but then these included not only both sexes and very various ages, but the subjects of them belonged to widely different professions and social ranks. To any one who knows the compo-

sition of the English Universities it need hardly be remarked that the overwhelming majority of the students there belong to what may be called the upper professional and gentle classes; and to any one who knows anything of the elements of statistics it need not be added that the more homogeneous our class the smaller the number of instances required in order to establish any conclusions referring to that class.

The subjects of measurement mostly belonged, as just remarked, to the upper professional class. They had, therefore, in most physical respects been made the most of, *i.e.*, they had always been well fed and clothed, and had started well by being the progeny of parents who had mostly for some generations enjoyed the same advantages. They may therefore be supposed to represent as good a type physically as any class of Englishmen, under existing social circumstances, can be expected to show.

The principal interests of the results now in hand, however, depend upon the conclusions that can be drawn about the intellectual characteristics, and the correlation of these with the physical. Any classification of this sort has not, I believe, been attempted before, at any rate on any similar scale, nor is it easy to see under what other circumstances such a classification could be carried out. If any one will reflect for a moment upon the vagueness with which the terms "clever" or "able," &c., are applied to human beings, and upon the abundant sources of bias and confusion which attend their application, he will recognise at once that it is no easy thing to make even a rude division founded on intellectual characteristics. Some kind of objective standard, *i.e.*, one about which no dispute can be raised, must be employed, or the results would be comparatively worthless. Something might possibly be done in this way, by comparing, say, the privates in the engineers (who are all, I believe, required to have learnt some trade) with those in an ordinary infantry regiment; or by comparing the foremen in workshops with the common workmen. But even in these cases the intellectual qualification only enters slightly and indirectly, and as one out of a variety of elements.

At Cambridge no difficulty was felt on this score, and all that was required was some trouble on the part of the tutors of the various colleges, who all most kindly gave me their assistance. A three-fold division was adopted, distinguished here as A, B, and C. By A is meant a first-class man, in any Tripos examination, or one who is a scholar in his college. By B is meant all the remaining "honour men," and by C those who may be called "poll-men," *i.e.*, candidates for the ordinary degree. The "plucked" men, of course, if any such presented themselves, fell into this category.

Every Cambridge man will be able to appreciate the value which ought to be assigned to such a distinction in respect of accuracy and general significance. But for the benefit of others a few words of explanation may be added. Lists were drawn up of the men who had been measured, separated according to their colleges, and the tabulation of them was obtained from the tutors. Of course, in the case of graduates, the grounds of distinction were simply a matter of fact; but in the case of those who had yet to take their degree, an estimate had to be made. But in these days of much examination, and with the thorough knowledge possessed at present by most of the tutors as to the capacity and attainments of their pupils, very little hesitation was felt in the distribution of the characteristic marks. Had the decision been left to a jury of the men themselves, the results would have been almost the same: indeed, if each man had undertaken to label himself, it is not likely that any difference would have been produced sufficient to have any serious effect upon an average.

The question of the general significance of this decision is a somewhat different one. I do not want to overrate its importance, but it seems to me about as good as any such intellectual test can be. The modern Triposes, or honour examinations, are numerous and various, and give an opening to every kind of capacity and attainment. The only defect entailed in such a method, and it must be admitted that it is an unavoidable defect, consists in the fact that a certain proportion of men of equal capacity with the most successful fall into the ranks of the non-reading, owing to indolence or counter attractions of other kinds, or occasionally from ill-health. This must be allowed for what it is worth. But to any one who is inclined to underrate the value of such a distinction, I would ask, where else can anything approaching to it in value and correctness be obtained? Let any one try to picture the results of dividing into "very good," "good," and "indifferent," in respect of their intellectual capacity, the members of any trade or profession, or those who follow art or science, on some system which shall not only be agreed to by any impartial jury, but shall even be accepted by the persons themselves, and I think he will see that there is comparatively not much to complain of in the results here discussed.

One more remark may be added. It is sometimes the practice to despise the "poll-man," as if he were intellectually but a very poor specimen. His absolute value may not be great, but measured by the standard of ordinary English culture, he is by no means bad. On the average he is quite up to the level of the professional man, clergyman, lawyer, doctor, military man, and so forth, in fact he forms a large element of the more

cultivated part of these classes; and all these classes represent the sifting out, by an intellectual test, from the mass left behind.

The outcome of all this may be thus described. We are concerned here, broadly speaking, with the upper professional class of Englishmen. Our students are, as regards their physical characteristics, a purely chance group from this class; but as regards their intellectual characteristics, they must be considered as very decidedly selected. As soon as they have come into residence we are able to sub-divide them, with a very fair approach to accuracy and confidence, into three classes, turning on intellectual considerations alone.

There seem to be three main enquiries of interest here, which may be briefly noticed in turn:—

I. We may compare the students, as a class, with the miscellaneous persons measured at South Kensington.

II. We may compare the A, B, C classes with each other, in order to determine whether any physical characteristics, for better or for worse, are associated with the intellectual distinctions.

III. We may examine, within each of these classes, whether any physical alteration, and if so, in what direction, is found to display itself, between the ages of nineteen and twenty-four.

I. As regards the first point, the best way of illustrating the import of our statistics will be to adopt a plan resembling that of Mr. Galton's *percentiles*:—

Class.	Height in inches.	Strength of pull (lb.).	Squeeze (strongest hand).	Breathing capacity (cubic inches).
1st ten ..	72 to 77·8	102 to 155	103 to 125	305 to 400
2nd ten ..	71 — 72	95 — 102	98 — 103	284 — 305
3rd ten ..	70·2 — 71	90 — 95	94 — 98	274 — 284
4th ten ..	69·5 — 70·2	86 — 90	90 — 94	265 — 274
5th ten ..	68·9 — 69·5	83 — 86	87·5 — 90	254 — 265
6th ten ..	68·3 — 68·9	80 — 83	86 — 87·5	248 — 254
7th ten ..	67·6 — 68·3	76 — 80	82·5 — 86	235 — 248
8th ten ..	66·8 — 67·6	72 — 76	78·5 — 82·5	223 — 235
9th ten ..	65·6 — 66·8	68 — 72	73 — 78·5	209 — 223
Lowest ..	60·1 — 65·6	35 — 68	45 — 73	90 — 209

On this scheme the total numbers are supposed to be reduced to the scale of 100, and these to be then divided into ten equally numerous classes. There are several advantages about this method. For one thing any subject of measurement can at once see whereabouts on the scale he stands. Thus, a man of 5 feet 8 inches, who can "pull" 81 lb., can "squeeze" 88 lb., and can "breathe" 270 inches, stands respectively in the 7th, 6th, 5th, and 4th classes. The central line dividing the 5th and 6th classes corresponds to the mean or average man. But the main objects here are to display the extremes of range, and, still more important, to display the law of grouping or "Law of Error" between those extremes. Any one who chooses to examine the numbers in each class will find that the law of dispersion here corresponds pretty closely to the normal one known as the Binomial or Exponential Law.

The total number of men measured here was 1,450. In the tables which follow there are only 1,095, as deductions had to be made for those about whose position in the A, B, and C classes there was some uncertainty, and for other causes. When the mean of these, and of the remaining elements common to the two sets, is compared with the mean of some of those of South Kensington, the result is as follows:—

	Height.	Pull.	Squeeze.	Breathing.	Weight.
Cambridge	68·9	83	87·5	254	153·6
Kensington ..	67·9	74	85	219	143

At first sight the superiority of the former will seem enormous, and after all deductions are made the disparity remains considerable, and gives abundant justification to the conclusion of Dr. Roberts as to the high physical characteristics of the English upper professional class.

As regards height, no qualification is needed, and no statistician will need to be told what a very large amount is represented by an *average* difference of one inch.

In regard to the other elements we must remember that the Cambridge measurements consist almost entirely of men between 19 and 25, whilst those at Kensington consist of men between 23 and 26, over which period they are presumably distributed evenly. In respect, therefore, of *weight*, which increases with age, the real difference between the the two is somewhat underrated. But in respect of muscular strength and breathing

power, where there is a loss with each successive year after 23 or 24, the difference is possibly overrated. Another cause of error probably lies in the necessary imperfection of the instruments for measuring muscular strength. For reasons previously given, I should much doubt if their indications can be relied on within two or three pounds. With the spirometer, it is otherwise, and the difference here (after necessary qualification) is very great. It indicates what a largely superior breathing capacity is inherited or acquired by the practice of continued out-door exercise from childhood.

II. We now come to the main subject of interest so far as our university students are concerned, viz.: Is there any difference, and, if any, what is the nature and magnitude of it, between the physical characteristics of our A, B, and C classes? The following tables contain all the information available upon this subject. They give the measurements of all the students as to whose intellectual status definite information was attainable, viz., 258 A, 476 B, and 361 C; or a total of 1,095. The first eleven columns contain the separate measurements as described at the commencement of this paper. The twelfth and thirteenth give the mean of the right and left eye power, and right and left squeeze. The fourteenth gives the product of the head measurements, and is therefore proportional to the total head capacity.

A mere glance at the tables will serve to show the following facts:—

(1.) In respect of height, weight, breathing and squeezing power, there is little or no difference between any of the classes.

(2.) In respect of eyesight there is a decided inferiority in the A's as compared with the B's and C's taken together; and in respect of the "pull," a similar inferiority of A to B and B to C.

(3.) In respect of head-measurement there is a decided superiority of A's over B's and B's over C's.

But something more than this must be attempted. When we are dealing with statistics, we ought to be able not merely to say vaguely that the difference does or does not seem significant to us, but we ought to have some test as to what difference would be significant. For this purpose appeal must be made to the theory of Probability. Suppose that we have a large number of measures of any kind, grouping themselves about their mean in the way familiar to every statistician, their degree of dispersion about this mean being assigned by the determination of their "probable error." And suppose that we take at random two batches of m and n from these measures. Then we know that if p be the probable error of the single

measures, that of *the difference between the means of any two of these batches* will be $p\sqrt{\frac{m+n}{mn}}$. Comparing, for instance the A's and C's, where the numbers are respectively 258 and 361, we have $\sqrt{\frac{m+n}{mn}}$ = approximately one-twelfth. That is, the differences between the means of such large numbers, had they been a true chance selection, would have displayed a probable error of only one-twelfth of that of the single measures. All that then remains to be done is to calculate the probable error of each of these elements separately, which is done in the usual way by determining the "error of mean square." They are as follows, in the case of the only elements about which any doubt can arise:—[1]

Probable error of individual eyesight		=	3·7 inches.
,, ,,	"pull"	=	7·6 pounds.
,, ,,	O.S. head measurement	=	·145 inches.
,, ,,	F.B. ,,	=	·173 inches.
,, ,,	A.B. ,,	=	·186 inches.

For instance, the difference in the mean length of clear vision between the A's and the C's is about an inch and a quarter; that between the same classes, of the age of 24, is slightly more, viz., about an inch and one-third. But the former is the difference between the means of 258 and 361, the latter that between means of 25 and 13. By the formula above given we find that the respective probable errors of the differences between these means are one-twelfth and one-third of 3·7 inches, *i.e.*, about ·3 inches and 1·2 inches. The latter is almost exactly the observed difference, which is therefore seen to be quite insignificant. The former is about one quarter of the observed difference, which is therefore highly significant; for the odds are about 25 to 1 that a measure of any kind shall not deviate by three times its probable error.

The above remarks are somewhat technical, but their gist is readily comprehensible. They inform us which of the differences in the above tables are permanent and significant, in the sense that we may be tolerably confident that if we took another similar batch we should find a similar difference; and which of them are merely transient and insignificant, in the sense that another similar batch is about as likely as not to reverse the conclusion we have obtained.

Unaided common sense might possibly have found its way

[1] O.S. signifies here "opposite sides," *i.e.*, from temple to temple. F.B. signifies "front to back." A.B. signifies "above the brow," a line being drawn from brow to earhole.

aright here in the case of the eye-sight, and the "pull," but it would hardly have done so in the case of the head-measurements. For instance, the difference between the mean "front to back" measurements in the case of the A's and C's is only about the tenth of an inch; a quantity hardly appreciable to ordinary observation. But when we observe that this quantity is about seven times the probable error we see that its chance occurrence is excessively unlikely.

The drift of these last remarks is simply to justify the summary conclusions which were drawn two pages back. They enable us to say not merely that the differences in question have actually presented themselves in the given range of statistics, but that they may be confidently expected to do so in future under similar circumstances.

We find then that, in regard to all the ordinary elements of health and strength, there does not seem to be the slightest difference between one class of our students and another: that is, they are equally tall, they possess the same weight, the same muscular strength of hand, and the same breathing capacity,—this last characteristic probably carrying a good deal along with it. The only exception here is in respect of the "pull," which is not very easily accounted for. If the practice of rowing were specially the amusement of those who do *not* read, we should have a plausible explanation; but I hardly think that any one who knows the habits of our students would say that this is the case. With this exception we may say that there is nothing in the previous habits of life of the reading men, in their inherited condition of body, or in the pursuits they follow when in residence, to give them any physical distinction for better or worse as regards what is commonly understood by "strength."

In respect of eye-sight there is a difference. The high honour men have a certain slight but pronounced inferiority in this respect. But this characteristic requires a little closer attention. In the case of each of the other measured elements the usual law of error is justified, that is, the variations on each side of the mean are symmetrical, and fall off very rapidly as we recede from the mean (a glance at the first table will display this characteristic in the case of the four elements there represented). But the full course of the curve of facility of eyesight is not represented. It stops abruptly at 35 inches, owing to the instrument not being graduated beyond this point, so that the assigned mean is not the true mean. But again, the case in question is one in which the arithmetic mean itself is not, taken alone, a fair test. This will be seen by a glance at the actual statistics in the case of our A men. The number measured was 260, the power of both eyes being separately determined.

Inches	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	Total
Men ...	18	0	0	8	14	19	12	28	18	22	18	39	55	36	52	58	50	32	41	520

The ordinary mean here, viz., 22·7, is obviously an imperfect guide in respect of both the above considerations. What we ought to do is to consider the men who are marked with 0 (viz., those who could not see to read at any distance without glasses) separately. And in respect of the others what we ought to do, owing to the obvious asymmetry of the curve of frequency, is to take not the arithmetic mean but what is called the "point of maximum frequency," as this is a far truer index of what may be considered the normal length of vision. But any successful appeal to this requires far more extended statistics than those at our disposal.

When we separate the men of "no sight" (without glasses) we find that the prominent distinction between the reading and non-reading classes lies here; the number of these, per thousand, amongst the A, B, C, being respectively 34, 13, and 16. When these are subducted, the difference between the remaining groups is diminished, and does not appear to me to be very significant. That is, the main characteristic of the reading men is that a larger proportion of them are distinctly short-sighted.

In respect of head measurement, the difference, though actually small, seems decisive. The three dimensions are as follows:—

	O.S.	F.B.	A.B.	Product of the three.
A	5·99	7·66	5·33	244·56
B	5·93	7·57	5·30	237·91
C	5·91	7·55	5·31	237·33

III. The only remaining point is the consideration of the laws of growth and decay within the limits of age here considered, in respect of each of the capacities measured.

The general conclusions seem to be the following:—

1. Eye-sight. There seems, on the whole, a decided decline from the age of 19, and to much the same extent in the case of each of the three classes. The only exception is about the age of 24, where there appears to be a marked revival. As to the explanation of this latter fact, I have no conjecture to offer

in the absence of specific information as to the general character and habits, &c., of the men of this age.

2. As regards the power of pulling, squeezing, and breathing, there is a maximum about the age of 23 or 24, after which the strength seems to begin to fall off.

3. The height shows no apparent growth after 19.

4. The weight on the whole shows a tendency to continuous increase.

5. As regards the head-measurement, there seems to be a small, but decided increase after the age of 19, in the case of all the students alike.

As these changes appear to be about the same in the case of the A, B, and C men, it will be convenient to throw the three classes into one, in order to secure the stability of larger numbers. The results are given in the following table :—

Age.	Eye (mean).	Pull.	Squeeze.	Breath.	Weight.	Head.	Nos.
19	25·5	81·0	82·0	251	151	234·7	139
20	24·3	82·3	83·9	253·5	152·5	238·0	305
21	23·4	83·9	83·7	256	153·5	238·6	248
22	23·6	86·8	85·7	261·5	153·5	242·7	189
23	21·8	82·4	85·0	260·0	155	239·7	83
24	24·3	88·7	87·3	258	158	247·0	52
25→	22·4	80·9	82·3	251	155	244·6	79
							1095

(A.)

Age.	Sight.		Pull.	Squeeze.		Head			Breath.	Height.	Weight.	Sight (mean).	Squeeze (mean).	Head (product).	No. of (measures).
	R.	L.		R.	L.	O.S.	F.B.	A.B.							
19	24·1	22·8	75·4	81·5	78·8	5·97	7·66	5·29	249	69·07	147	23·4	80·2	241·91	17
20	23·9	23·8	81·0	86·0	82·5	5·95	7·67	5·35	255	69·17	151·8	23·8	84·2	244·15	54
21	23·2	23·6	81·4	85·1	80·2	5·94	7·63	5·33	256	68·91	153	23·4	82·6	241·03	52
22	21·5	21·6	81·8	86·7	82·8	6·04	7·72	5·32	262·5	68·63	154·1	21·5	84·8	248·06	50
23	19·6	20·9	80·7	87·0	84·1	6·04	7·54	5·37	262	69·66	151·8	20·2	85·6	244·55	27
24	23·0	24·1	87·6	87·1	82·4	6·06	7·71	5·26	261	68·58	155	23·5	84·7	245·76	25
25→	22·6	22·6	79·7	84·0	78·5	6·04	7·69	5·35	246	68·64	155	22·6	81·2	248·94	33
Mean	22·6	22·8	81·3	..	..	..	..	..	256·2	68·93	154	22·7	83·5	244·94	258

(B.)

Age.	Sight.		Pull.	Squeeze.		Head.			Breath.	Height.	Weight.	Sight (mean).	Squeeze (mean).	Head (product).	No. of (measurements).
	R.	L.		R.	L.	O.S.	F.B.	A.B.							
19	24·9	25·2	80·4	83·3	79·3	5·93	7·53	5·31	251·5	68·78	150	25·0	81·3	237·10	70
20	24·3	24·4	82·9	85·7	83·4	5·93	7·57	5·30	254	68·94	152·5	24·3	84·5	237·91	149
21	23·6	23·6	83·4	86·3	81·9	5·92	7·57	5·26	256	68·69	152·5	23·6	84·1	236·40	117
22	25·6	25·3	86·4	86·2	83·5	5·95	7·62	5·33	261	69·31	152·3	25·4	84·8	241·65	73
23	23·4	23·4	80·2	84·7	81·3	5·95	7·55	5·32	262	69·48	155	23·4	83·0	238·98	33
24	25·3	26·5	93·0	93·0	89·0	6·04	7·73	5·38	269	69·57	163·5	25·4	91·0	251·18	14
25➔	23·6	21·3	85·4	90·4	85·4	5·92	7·57	5·32	267	69·34	159·8	22·4	87·9	239·10	20
Mean	24·3	24·3	83·1	..	..	..	..	..	256·2	68·95	153	24·4	84·1	238·42	476

(C.)

Age.	Sight.		Pull.	Squeeze.		Head.			Breath.	Height.	Weight.	Sight (mean).	Squeeze (mean).	Head (product).	No. of (measures).
	R.	L.		R.	L.	O.S.	F.B.	A.B.							
19	25·3	25·8	83·6	86·9	80·2	5·77	7·52	5·28	250	68·93	153	25·5	83·5	229·10	52
20	24·7	24·3	82·2	84·8	79·2	5·91	7·52	5·29	252	68·87	152·7	24·5	82·8	235·10	102
21	23·7	22·4	86·3	86·3	82·2	5·94	7·56	5·35	255	68·96	155·5	23·0	84·2	240·24	79
22	23·5	23·2	91·1	89·3	85·8	5·97	7·57	5·31	261	68·64	154	23·3	87·5	239·97	66
23	21·0	21·6	87·5	89·7	84·7	5·91	7·53	5·28	254	69·31	158	21·3	87·2	234·97	23
24	24·3	25·3	86·3	89·8	87·0	5·97	7·68	5·33	240	68·00	156	24·8	88·4	244·37	13
25→	21·6	22·8	79·2	81·9	77·2	6·02	7·56	5·34	244	67·59	152·5	22·2	79·5	243·48	26
Mean	23·87	23·77	85·2	..	..	..	..	..	253·0	68·76	154	23·7	84·1	237·20	361

The following paper was read by the President:—

On HEAD GROWTH *in* STUDENTS *at the* UNIVERSITY *of* CAMBRIDGE.[1]

By FRANCIS GALTON, M.A., F.R.S.

[WITH PLATE VIII.]

IN the memoir just read by Dr. Venn upon the measurements made, during the last three years, of the students of Cambridge, one column is assigned to what he terms "Head Products," and which may fairly be interpreted as "Relative Brain Volumes." The entries in it are obtained by multiplying together the maximum length and breadth of the head and its height above a specified plane. The product of the three determines the contents of a rectangular box that would just include the portion of the head referred to. The capacity of this box would be only rudely proportionate to that of the skull in individual cases, but ought to be closely proportionate in the average of many cases. The relation they bear to one another affords, as it seems to me, a trustworthy basis for the following discussion, especially as all the measurements were made not only on a uniform plan, but by the same operator.

It will be convenient to reproduce Dr. Venn's figures in a separate table, neglecting the second decimal:—

Head Products.

Ages.	Class A. "High honour" men.	Number of measures.	Class B. The remaining "honour" men.	Number of measures.	Class C. "Poll" men.	Number of measures.
19	241·9	17	237·1	70	229·1	52
20	244·2	54	237·9	149	235·1	102
21	241·0	52	236·4	117	240·2	79
22	248·1	50	241·7	73	240·0	66
23	244·6	27	239·0	33	235·0	23
24	245·8	25	251·2	14	244·4	13
25 and upwards	248·9	33	239·1	20	243·5	26
		258		476		361

The figures in the table are thrown into diagrams I, II, and III (Pl. VIII), in which curves are also drawn to interpret what seems to be their significance. The great irregu-

[1] This paper appeared in "Nature," of May 3, and the editor of that Journal has obligingly supplied the diagrams in Pl. VIII.

larity in fig. II, corresponding to the age of twenty-four, may be fairly ascribed to the smallness of observations, only thirteen in number, on which it is founded. The three resultant curves are shown by themselves in fig. IV, where they can be easily compared. It will then be seen that the A and C curves are markedly different, and that the B curve is intermediate. Accepting these curves as a true statement of the case—and they are beyond doubt an approximately true statement—we find that a "high honour" man possesses at the age of nineteen a distinctly larger brain than a "poll" man in the proportion of 241 to 230·5, or one that is almost 5 per cent. larger. By the end of his College career, the brain of the "high honour" man has increased from 241 to 249; that is by 3 per cent. of its size, while the brain of the "poll" man has increased from 230·5 to 244·5, or 6 per cent.

Four conclusions follow from all this:—

(1.) Although it is pretty well ascertained that in the masses of the population the brain ceases to grow after the age of nineteen, or even earlier, it is by no means so with University students.

(2.) That men who obtain high honours have had considerably larger brains than others at the age of nineteen.

(3.) That they have larger brains than others, but not to the same extent, at the age of twenty-five; in fact their predominance is by that time diminished to one-half of what it was.

(4.) Consequently "high honour" men are presumably, as a a class, both more precocious and more gifted throughout than others. We must therefore look upon eminent University success as a fortunate combination of these two helpful conditions.

Description of Plate VIII.

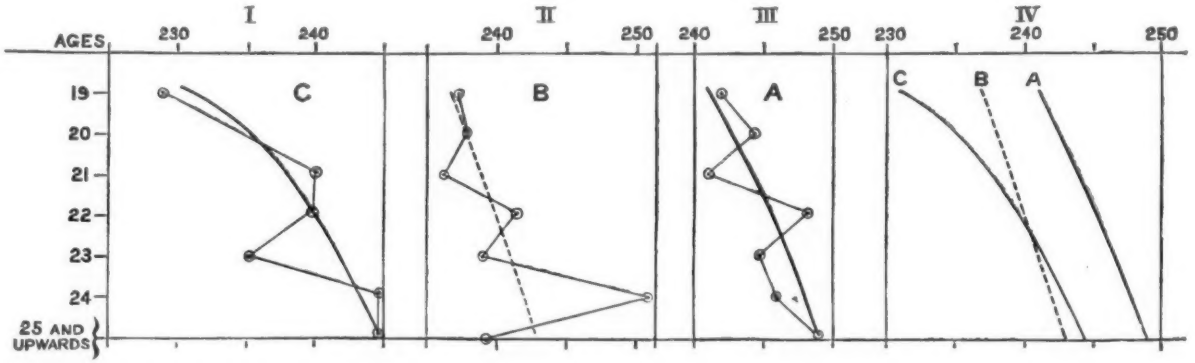
Diagrams illustrating the relative brain capacity of Cambridge University men, according to their proficiency and age.

DISCUSSION.

Mr. E. W. BRABROOK observed that the statistics of the B class at the age of twenty-four, showed a remarkable aberration, being in fact in excess of any other class at any age, no doubt due to the smallness of the number under observation. This led to the inquiry whether any individual cases of exceptionally large size were included in this particular group; and whether a curve struck upon the line of greatest frequency might not be more symmetrical. In any case, it was very satisfactory to observe that these investigations proved the physical advantage of high culture, and proved also that it was most valuable to those who entered upon it from the lowest plane. The thanks of the Institute were due to Dr. Venn and Mr. Galton for this important contribution to knowledge.

RELATIVE BRAIN CAPACITY OF CAMBRIDGE UNIVERSITY MEN ACCORDING TO THEIR PROFICIENCY AND AGE (FROM DR. VENN'S TABLES).

The Numerals along the top of the diagrams signify the product of the three Head measures, viz. :— Length × Breadth × Height (in inches).



A, High honour Men; B, The remaining honour Men; C, Poll Men.

Journ. Anthrop. Inst., Vol. XVIII, Plate VIII.

The following paper was then read by the President :—

REMARKS *on* REPLIES *by* TEACHERS *to* QUESTIONS RESPECTING MENTAL FATIGUE.

By FRANCIS GALTON, F.R.S., President.

THE question of over fatigue of the brain in schools was discussed some months ago with much heat, and the arguments on either side were supported by experiences that so flatly contradicted each other, as to make it difficult to arrive at just conclusions. After the heat of discussion had somewhat cooled down, it happened that I was asked to occupy the chair at a meeting of the Educational Section of the Teachers' Guild, and while doing so I was much impressed by the eager and sustained attention of the large audience to the memoir read on that evening. It occurred to me that the Teachers' Guild might become a powerful instrument for the solution of statistical problems, if the interest of its intelligent members could be excited in inquiries bearing on Education, and if their good will and confidence could be gained. I determined to make a trial, and selected questions bearing on fatigue for the purpose. The Council of the Guild kindly assisted me by circulating my questions, together with a covering letter from their Vice-Chairman, Dr. Morse. The replies to those questions form the basis of the following remarks. Let me say at once, that I was somewhat disappointed in respect to the number and fullness of the replies—so much so, that I long hesitated to publish anything before supplementing them with other materials, to be gained gradually through my own observation, but having much else on hand, it seemed on the whole best to work off this matter at once, without admixture. I have 116 replies from teachers, many of large experience, concerning both themselves and their pupils, and as this is just sufficient to deserve a separate discussion, I shall not travel beyond the bounds of what may be called my brief, I will not enter upon other materials, and barely into the psycho-physics of fatigue, but shall merely set forward in an orderly way the statements contained in the 116 replies.

The objects of my questions were first to determine the signs and effects of incipient fatigue in as *measurable* a form as possible ; for it is obviously most desirable to know what the tests of fatigue should be, in consequence of the contradictory opinions above alluded to. There ought to be no room for doubt as to whether the pupils in a particular school or class, and at a particular time, were or were not over fatigued. Secondly, I wished to hear from the teachers whether they had themselves

ever broken down from over work, and what their own experiences might be concerning their pupils and friends. The actual questions are subjoined: numbers 1, 2, and 3 regard the person addressed; 4, 5, 6, regard their pupils and acquaintances.

1. What particular mental work can you perform easily, when your mind is fresh, that you find difficult or impossible when your mind is somewhat fatigued? 2. Has illness, due solely to mental overwork, independent of domestic anxiety and worry ever incapacitated you for more than a month at a time from ordinary school work? If so, give dates and symptoms. Do you consider your present health to be in any way affected by that illness? 3. Has experience discovered to you any warning signs, bodily or mental, distinct or obscure, of the imminent approach of mental fatigue, other than the growing sense of becoming fatigued? If so describe them. 4. What particular intellectual work do you find your pupils perform with ease when their minds are fresh, in which they fail more or less when they are mentally fatigued, even though they are still interested in their work? 5. Have you known cases of more or less serious prostration from mental overwork, as distinguished from the effects of domestic or other anxiety? If so, give initials and dates, and a very brief notice of the severity and duration of the illness? 6. Has experience discovered to you any warning signs of imminent mental fatigue among over zealous pupils?

The upshot of the replies to the questions is as follows:—

General Aspect.—Experienced teachers place most dependence on the general aspect of their classes, due to a variety of small indications, such as jaded expression and abnormal skin colour. They more especially speak of a strange look in the eye, which is variously described as dazed, weary, fixed, or lack lustre, as being a peculiarly characteristic indication that work should be slackened at once.

Nervous Irregularities.—Restlessness appears to be the commonest sign of partial fatigue: that is, of the attention being wearied while the muscles are craving to be employed. I may here for one moment break my plan of not travelling beyond my brief by alluding to a short account I wrote in "Nature" three years ago, Vol. xxxii, p. 174, but signed only with my initials, entiled "Measure of Fidget," describing how I had succeeded in counting the varying rate of fidget of a section of a large audience during the reading of a wearisome memoir. I have since frequently tried this method; it is an amusing way of passing an otherwise dull evening, but in drawing conclusions from the number of movements the average age of the audience and their habits of thought have to be taken into account. Children are extraordinary mobile, and those adults who are little accustomed

to concentrate their attention, are rarely still except when spell-bound by eloquence. On the other hand I have frequently noticed at meetings of the Royal Society, that as many of the persons present as I could hold in a glance, were all as rigid as statutary for many seconds together. Yawning and lolling are common among tired children, and twitchings and grimaces, which in serious cases culminate in St. Vitus' dance. Here are some extracts from the various replies.

1. Sudden muscular movements. 2. Grimaces, frowning, or compression of the lips are marked signs. 3. The fingers sometimes twitch and the whole nervous system seems affected. 4. Twitching of the face. 5. Twitching, blinking the eyes. 6. Fluttering of the eyelids. 7. Tendency to nervous laughter or movements. One correspondent has fits of sneezing in the early morning when he has been fatigued over night.

General unsteadiness of muscular co-ordination is shown by bad and shaky handwriting: this is sometimes specifically mentioned, but more often implied by such phrases as—8. Careless writing; or, 9. "Failure in all work requiring neatness." 10. Sometimes a loss of power to continue writing, the pen going crooked, &c. Fatigue is also very frequently indicated by disordered utterance as—11. Tendency to stumble over words when speaking. 12. Refusal of the tongue to obey the will, so that in speaking or reading I substitute one word for another.

Irregularity of nervous action is further shown by conditions of pallor or of flushings in the face. They sometimes alternate; testifying to a depression of general nerve power, combined with morbid excitability. Allusions to abnormal skin colour are frequent in the replies. One teacher goes so far as to lay particular stress on the colour of the tips of the ears in deciding whether and in what way the girls of her class are suffering. If the tips are white, flaccid, and drooping she concludes the girls are thoroughly weary in mind. If they are relaxed but purplish, she concludes that they are "tired not with study but from struggling with their nerves, which the average school girl of 14 or 15 very rarely has completely under control."

Headaches.—The frequent occurrence of headaches in varied forms and in every degree of severity may be accepted as a matter of course. Similarly as regards cold feet, faintness and actual faintings. Sleeplessness in a very serious degree is another well-known sign; much more rarely somnolence. Grinding the teeth at night and talking in the sleep are frequently mentioned; somnambulism occasionally so. I do not propose to enter into details respecting any of the matters just mentioned, as they are all of them well known signs of over fatigue. It may, however, perhaps interest the meeting to see

a drawing I hold in my hand made in sleep not many weeks ago, by a young friend and connection of my own, who was studying rather too hard for a Government examination. He awoke in the night, and found himself in his nightgown, sitting at his table with the gas burning and with this grotesque sketch of an elephant's head and of some other animals just completed. The ink was still wet. He had not the slightest recollection of anything previous to the act of awakening, but there had been conversation before he went to bed that probably suggested the sketch.

Disposition.—Irritability is perhaps the commonest sign of incipient fatigue. My correspondents freely acknowledge it to be so with themselves and it is very easily noticed among their pupils, who become cross and peevish when tired. I shall not enter further into this, as the fact is a familiar one; it is also well-known that the nerves of sensitive people becomes so irritable by overwork as to be painfully jarred by what they wholly disregard when well, such as the ticking of clocks and the rattle of the street. A most pitiable amount of suffering is disclosed in these replies, due to nervous irritability. Much is said of the gloomy way of looking at life, that is brought on by overwork; of the sense of incapacity, of magnifying trifles, and of dread of society. Irritability is sometimes accompanied by a notable amount of ordinary excitability expressed by such remarks as—1. I get nervous and start at noises. 2. I start sometimes at a sudden noise or movement in the room.

It is, I need hardly say, known by experiment, that both the quickness and the magnitude of the reaction to any stimulus is greatly affected by fatigue.

There is an experiment, not so well known as it should be, that after a class had practice in performing it, can be repeated at any time in a few seconds, which gives an excellent measure of the varying amount of reaction time. The class take hands all round, the teacher being included in the circle, a watch with a seconds hand lies on the table before him. All the pupils shut their eyes. When the seconds hand of the watch comes over a division the teacher gives a squeeze with his left hand to the right hand of the pupil next to him. That pupil forthwith with his left hand squeezes the right hand of the next pupil, and so on. Thus the squeeze travels round the class and is finally received by the right hand of the teacher, who then records the elapsed time since he started it; or he may let it make many circuits before he does so. This interval divided by the numbers of pupils in the class and by the number of circuits, gives the average reaction time of each pupil. The squeeze takes usually about a second of time to pass through

each dozen or fifteen persons. We should expect to find uniformity in successive experiments when the pupils are fresh; irregularity and prevalent delay when they are tired. I wish that teachers would often try this simple, amusing, and attractive experiment, and when they have assured themselves that their class enters into its performance with interest and curiosity, they might begin to make careful records at different periods of the day and see whether it admits of being used as a test of incipient fatigue. I should be exceedingly glad to receive accounts of their experiences. Deception must of course be guarded against.

Senses.—The frequency with which serious alteration in the power of hearing and of seeing is mentioned, and the feelings sometimes of intense sensitivity and sometimes of numbness, show that the delicacy of the senses is markedly affected by fatigue.

Hearing is often heightened in keenness, sometimes it is dulled. It is heightened in those numerous cases of irritability of which I have spoken, when the tired brain becomes almost maddened by an organ grinder. It is temporarily paralysed in others. The following is a mixed case:—1. My hearing had never been very acute, and I think the first symptom of fatigue is a feeling of deafness, but at the same time that I cannot hear the voices I want to hear, the outside noises of traffic, bells, &c., become intolerable. Other cases of deafness from fatigue are—2. Inability to hear in school without a painful effort. 3. Increased deafness.

Vision is greatly affected by over fatigue, not only owing to the strain upon the eyes from much reading in a bad light, but apparently through more deeply-seated causes as well. It is difficult otherwise to account for the following interesting case in which colour-blindness was brought on by fatigue and disappeared after rest. It has much physiological interest and well deserves being placed on record. The lady allows me to mention her name for the sake of authenticity. She is Miss J. Beckett, Girls' Grammar School, Ripon.

"After several hard hours of continuous study I have been subject to attacks of colour-blindness, which leave me after resting. The first time I noticed that I was not able to distinguish one colour from another, was when I was reading for the London Matriculation years ago. I was at the same time etching for an American magazine and teaching most of the day. This lasted from Christmas to July, when I began to feel considerably worn out. One day I went to spend a few hours with a friend, and whilst there, began to paint some ivy leaves on a terra-cotta plaque. Imagine my distress when my friend told

me the leaves were orange instead of green. On my return I went into my study and to my astonishment, the curtains which were blue in colour looked a kind of dingy yellow. However in a few hours I was quite well. Towards the end of the year I was obliged to give up work on account of my health. I got well, and took up my work again, still subject to temporary colour-blindness when tired." In answer to further inquiries, she adds: "I do not remember whether I have any difficulty in recalling colours when tired. From a little child I have been particularly fond of them, and can readily paint flowers, foliage, and neutral tints from memory."

The frequency and severity with which the sight is affected by fatigue is sufficiently shown by the following extracts:—

1. The eyes fail first. Sometimes after hurrying to a lesson, on my arrival I could not see a single note on the page of music for a few minutes. After writing and playing long, everything goes black or black spots dance up and down. 2. A time of great excitement or worry will so affect my sight that for about half-an-hour at a time, I can see nothing clearly. The outline of everything is deficient in some part, so that I only see half of a thing at a time. There seems to be a bright wheel of light whizzing in the corner of one or the other eye.

3. At first the lines of the page become indistinct, then at intervals they appear to vibrate; finally they merge into one mass.

4. The words appear to rise from the paper and frequently a double row of words are visible.

5. Lights and after images are distinct before my eye.

6. A confusion in the lettering of mathematical diagrams is sometimes an early symptom of fatigue among my pupils.

As regards sensations in the eye itself, beside such remarks as—7. A dazzling and burning sensation in the eye, the following is a case of an affection of the eye being subordinate to that of the brain, rather than *vice versâ*.

8. A nervous sensation in the eyes as though the eyeballs were loose in my head, and would fall which ever way the head is inclined. The sensation is worse on lying down. I am somewhat short-sighted and wear glasses, but only feel this disagreeable sensation when mentally weary, not necessarily through over-reading.

Memory.—A very common and early symptom of fatigue is failure of memory, using that word in the allied senses of recalling ideas at will, or else of former ideas presenting themselves readily by association, or else of the sure association of muscular movements engaged in utterance, with the idea of the words intended to be uttered. I have made extracts of no less

than twenty-five cases of failure of memory, out of which I will select half-a-dozen.

1. My first indication of mental failure is an inability to spell common words; my second, an omission of words in writing; my third, sudden forgetfulness of what I am actually saying. 2. Tendency to forget the meaning of words in a foreign language which are usually well known or have been met with quite recently. Tendency to make stupid blunders in subjects in which, when the mind is in full vigour, it is accurate without effort. Simple and obvious mistakes are increased twofold in number, and that throughout the class. 3. Through days and weeks together, the utterance of wrong words or sentences, not intended or desired to be spoken, and the writing of wrong words. 4. Tendency to stumble over words in speaking, and to misplace letters in writing, generally putting them too soon as "Wesday" for "Wednesday." 5. Want of power of calling at will to memory, names and little matters connected with every day life. 6. Some of the pupils never spell correctly when tired.

Arithmetic and Mathematics.—The studies that are the first to fail under fatigue differ in different individuals, but in the majority of cases those of arithmetic and elementary mathematics go soonest. Though many of the 116 replies come from teachers who have little, if anything, to do with those subjects, no less than forty-seven specifically mention them. For example:—

1. The merely mechanical processes of arithmetic become bewildering at the end of a day in which I have been particularly engrossed with school work.

2. Arithmetic and algebra become impossible when fatigued not as being disagreeable or painful, but because I then blunder so much that it is hardly any use attempting them.

3. Another correspondent speaks of the impossibility when fatigued of doing work that requires both accuracy of detail and a certain force of will to fix the attention, such as arithmetic.

4. Speaks of the difficulty to tired boys of working out any *common sense* problem in arithmetic.

Though very many similar answers could be quoted in corroboration of these, there are two that tell in an opposite direction. They are—

5. Whenever my mind is wearied, it affords me a certain amount of relief to do some work which involves the solving of arithmetical and algebraical problems, and by preference such as call for the use of logarithms or of the slide rule.

6. I find accounts a great rest when I cannot exert my mind usefully in any other way.

I may be permitted again to break my rule by adding a case

from my own knowledge of a very distinguished man, now deceased, who having always found repose in his favourite mathematics when he was fagged and worried by multifarious duties, naively recommended the same remedy to a friend whose brain had so broken down for a time, that he shrank from the least mental exertion as from a fatal danger.

Languages.—A difficulty in translating is another of the noticeable effects of incipient fatigue, and is partly due to the lapses of memory already spoken of.

1. In translating, words and phrases do not occur readily to the mind.

2. Translation into or out of a foreign language with which I am not very familiar.

3. I have occasionally lost the power of speaking German when fatigued, though when in my ordinary condition I speak it without conscious effort.

The failure to translate *well* is due of course to much more than the simple failure of memory in small things and depends on the loss of power of grasp, and on depressed mental vigour generally. The following is an instructive case :—

When I taught young boys of ages 8 to 13, all day, I took arithmetic and Latin in the morning, and English reading, geography, &c., in the afternoon. On some occasions the Latin lesson got put off till the afternoon, and I was surprised to find that lesson, which was always a successful one in the morning, failed entirely in the afternoon. The boys wished to learn but could not. Their ordinary work, which made less demand on the intellect, they did in the afternoon well enough.

This and such like cases fall more properly in the next division.

Failure of Mental Grasp.—The evidences that the fatigued mind is unable to work up to its normal standard, and that it wastes itself in futile exertion, are very numerous. They are such as :—

1. Failure of ability to grasp the meaning of even simple things.

2. Failure of the *portative* memory. In reading complete inability to take in the matter whilst mechanically scanning the page. A curious incapacity to count the cups when serving tea.

3. Reading sentences without recognition of what was read.

4. Confusion alternating with excessive clearness of thought.

5. Tendency of thoughts to wander. Failure in pupils to grasp the meaning of what is said to them quickly and fully.

6. Before the actual sense of fatigue is distinctly felt, I am conscious of a want of power to grasp ideas, and of an incapacity for conveying them clearly.

7. Inability to read the "Journal of Education."

8. Rapid disappearance of immediately preceding concepts, and hence difficulty in establishing connections between paragraphs, as in writing a Review article.

9. Tendency to *use long words.* (This strikes me as a very suggestive reply).

10. Any book in which the language is wanting in ease and simplicity, though its subject may be familiar or easily understood.

In short, to use a common and vigorous phrase, the mind ceases to *bite,* when it is fatigued.

Failure of Energy.—It requires no evidence to corroborate the well known fact that energy fails as fatigue increases. New subjects are distasteful; teaching dullards becomes almost an impossibility. Sustained effort, vigorous inspection, quick decision—all are impossible.

Possibility of Tests of Incipient Fatigue.—The replies I have received do not contain any distinct proposition of tests of incipient mental fatigue, and I am myself far too ignorant of the practice of education to venture to formulate any. On the other hand, the replies are not deficient in indications of what such tests might be directed to ascertain. They are principally as follows:—

1. The length of time during which neatness of execution can be sustained in performing a prolonged task.

2. Promptness and sureness of memory in simple things.

3. Common sense arithmetical problems.

4. Reaction time.

The measure of fatigue is inversely the measure of endurance, and this strikes me as being a faculty that well deserves investigation. Under the strain and exhausting calls of modern civilized life, the power of endurance is rising continually in importance. Men and women have now a-days to act rapidly and for many hours, and not only to act exceptionally well. It therefore seems very reasonable that teachers should direct their attention to some fair way of appraising the relative power of endurance among their pupils. It is of course incidentally discovered in the ordinary course of tuition, but one would like to see appropriate tests directly applied to determine it, and such as would show at any time in a definite and unmistakeable manner whether the minds of pupils were fagged or not.

Breaking Down.—I now come to the evidence given in these replies respecting the frequency with which both pupils and teachers are found to "break down." There is an intelligible and very transparent tendency in not a few of the respondents to say

that such a thing as overwork is impossible in their respective schools. Some of them protest so much and so extravagantly as to raise not a little suspicion. There are even a few who say they have never heard of a case of breaking down.

Taking all the replies together, I find that out of my 116 correspondents no less than 23 of them have at some period of their lives broken down, and that 21 of these have never wholly recovered the effects. There are six other cases of a less serious kind, some of them slight. In other words one out of five teachers has, so far as the evidence before me goes, been severely stricken. As to the cases well known to my correspondents, there is vagueness in some of the replies where the word "several," and the like, are used, to which I am quite unable to assign a numerical value, but 59 sad cases are specified in detail in answer to the question 5 : "Have you known cases of more or less serious prostration from mental overwork, as distinguished from the effects of domestic or other anxiety? If so, give initials and dates, and a very brief notice of the severity and duration of the illness."

In many other cases the writers express the difficulty they feel in distinguishing between worry and overwork. The latter is a consequence of the former, while the former often results from the gloom, anxiety, and sense of incapacity caused by the latter. It is a self regenerating circle of evil.

I draw two conclusions from the replies. The first is that the reason why mental fatigue leaves effects that are so much more serious than those of bodily fatigue is largely owing to the cause just mentioned. When a man is fatigued in body he has very similar symptoms to many of those mentioned above, but there is a great after difference. As soon as the bodily exertion has closed for the day, the man lies down and his muscles have rest; but when the mentally fatigued man lies down, his enemy continues to harass him during his weary hours of sleeplessness. He cannot quiet his thoughts and he wastes himself in a futile way.

The other conclusion is that breaks down usually occur amongst those who work by themselves, and not among pupils whose teachers keep a reasonable oversight. Over zealous pupils are rare, as many of my correspondents insist. But the danger is not so much at school, when the hours of study and those of play and exercise are fixed, as it is at the age when young persons are qualifying themselves for the profession of a teacher, and who have also to support themselves, and perhaps to endure domestic trials at the same time. Dull persons protect their own health of brain by refusing to overwork. It is among those who are zealous and eager, who have high aims

and ideas, who know themselves to be mentally gifted, and are too generous to think much of their own health, that the most frequent victims of overwork are chiefly found.

Discussion.

Mr. J. G. Fitch, Her Majesty's Inspector of Training Colleges, remarked that the returns collected with so much care by Mr. Galton were very interesting and suggestive, and might, if extended over a wider area, prove very useful. Meanwhile it should be remembered that their trustworthiness and value depended, in some measure, upon conditions which had not been referred to in the paper, and on which no information was before the meeting. In judging of the signs of incipient weariness or over-work in a class, the one consideration of most importance as a factor in the problem was the character of the teacher and of his lesson. A bright earnest teacher, who knew how to kindle the interest and sympathy of his scholars, would observe few or no tokens of fatigue, while a dull, spiritless and mechanical teacher might find his pupils restless or yawning before he had been five minutes in their presence. If there were two teachers, the one of whom was gifted with real aptitude and power and knowledge of method, and the other of whom was deficient in these qualifications, both might be at work in classes of the same number, the same age, and the same capacity, and might be teaching the same subject; yet their reports in answer to Mr. Galton's questions would differ substantially; for they would not only observe in a different spirit, but they would have very different phenomena to observe. Unless we know something of the character and capacity of the teachers, it would be unsafe to deduce any general inferences from their testimony on the mental fatigue of their scholars. Another condition very materially affecting the whole problem was the character of the time-table in use in the school. If the subjects of instruction were wisely distributed; if the lessons were not of undue length; if the various occupations of the day were so varied that light mechanical exercises alternated with lessons which required serious mental application, there need be little or none of the irritability or the languor so often complained of. Whether school-work was wearisome and hurtful or not depended not so much on its amount as upon the skill and good sense with which the work was planned, and with which the different mental and bodily faculties were called into exercise in turn. He did not say this to detract from the value of the very interesting enquiries which had been described in Mr. Galton's memoir, but merely to suggest caution in deducing inferences from the answers unless more was known about two of the most prominent and significant of the conditions of school-life—the quality of the teaching and the distribution of the employments.

Mr. Straker, following the suggestion of the previous speaker,

that the number of subjects probably influenced the amount of mental fatigue, said that he had worked at three subjects, taking them in turns, for two years, and that he was unable to do any work for about a year afterwards, from the resulting mental fatigue. The work was almost continuous; the subjects were absolutely unconnected with each other; two of them required much thought, one of the two a good deal of writing; the other was ordinary preparation for an examination, and was the easiest of the three, though taking about an equal amount of time. As to the amount of work, any two of the subjects would have been full ordinary employment. Therefore intervals of time which would have been occupied in relaxation were devoted to work.

He had previously suffered from mental fatigue, for a few weeks after his first examination at Cambridge, which he had prepared for in a very short time; also for many months after his Tripos, in which he took a low place in honours.

MAY 29TH, 1888.

FRANCIS GALTON, Esq., F.R.S., *President, in the Chair.*

The minutes of the last meeting were read and signed.

The election of W. GREATHEED, Esq., of 174, Euston Road, was announced.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From CHARLES HOLLAND WARNE, Esq.—Ancient Dorset. By Charles Warne, F.S.A.

From the INDIA OFFICE.—The Customary Law of the Rawalpindi District. Drawn up by Frederick A. Robertson, C.S.

From the INDUSTRIAL EDUCATION ASSOCIATION.—Physical and Industrial Training of Criminals. By Hamilton D. Wey, M.D.

From the AUTHOR.—Lingua: an International Language for purposes of Commerce and Science. By George J. Henderson.

—— The Prayer of a Navajo Shaman. By Dr. Washington Matthews, U.S. Army.

—— Le Tibia dans la Race de Néanderthal. Par Julien Fraipont.

From the DIRECTOR-GENERAL, GUATEMALA.—Informe de la Direccion General de Estadistica, 1887.

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The following papers were read by the Secretary and illustrated by a series of rubbings from the stones :—

On an INSCRIBED ROCK SURFACE *at* MEVAGH, ROSGUILE, COUNTY DONEGAL, IRELAND.

By G. HENRY KINAHAN, M.R.I.A., &c.

[WITH PLATE IX.]

THIS locality is near the old coast guard station at Mevagh, in Rosguile, hard by the north-west shore of Mulvay Bay.

Mevagh gives a name not only to the townland, but also to the parish, which seems to have been once a place of some note, containing an ancient church, graveyard, and cross, and the ruins of one or two cahers of the Donegal type (small diameter and very high walls), and various megalithic and other ancient habitations.

Near the scribed rock surface is "Crannog point." There is now no trace of a lake dwelling there; but possibly its site was off the point in the shoal portion of the bay. But as the term crannog is also applied to stepping stones in water, it may here have only been applied to a rude boat pier.

The scribed rock surface lies between the hamlet and the shore of the bay, and is an ice-planed wide felstone dyke, the markings generally occurring on a space about 60 feet long and from 15 to 20 feet wide. They occur more or less in groups, but some are scattered about, while elsewhere on the rock surface a few were detected, but so effaced as to be nearly imperceptible. They were first brought under my notice by my colleague, S. Bedoe Wilkinson.

The surface is very much weathered, especially on the flat portions, and in places it is more or less overgrown with a thin coat of peat or lichens, which had to be removed, and the surface washed, before the rubbings were taken.

No. 1 is the best preserved group (Pl. IX, fig. 1); it occurs on a slope to the south-east, which has been used as a slide by the children: this has given it a polish and preserved the marks from weathering. Here, as elsewhere, the more common figures are combinations of cups, circles, and furrows. In general at the centre of the figure there is a cup, but in a few there is a knob instead, and in two remarkable crosses. The scribe above the rest is unique, not having been found elsewhere, while a similar scribe to that to the right hand lower corner also occurs in the group rubbing No. 2. Two or three crosses occur in the group rubbing No. 5.

No. 2 is on the same surface as No. 1, but a little lower down

to the south-east. On this surface, as on No. 1, there is an open circle, with arms from it, while in one of the systems of circles there is a furrow running eastward across the surface, and not downward as is usual.

No. 3 is a system of large dimensions immediately south of the east portion of No. 2.

No. 4 is an isolated group some distance south-west of No. 1. All the scribes are of small dimensions, but among them is a peculiar Latin cross with a cup at the north end of the longest furrow. As can be seen from the rubbing, this surface is greatly weathered (Pl. IX, fig. 2).

No. 5 has besides elaborate combinations of circles and furrows, two or three crosses of the same character as those on No. 1. One of these crosses is well preserved, while the others are too much weathered to be satisfactorily made out.

The crosses on Nos. 1 and 5 are very interesting, as a similar cross found in the County Kerry on a slab by Dr. Graves, Bishop of Limerick, led him to believe the inscription was post-Christian. They, however, being found here would lead to the supposition that they were pre-Christian crosses.

A cross of the same type as the Latin cross, rubbing No. 4, occurs also on one of the Barnesbeg standing stones, some miles to the south in the country between Cresslough and Kilmacrenan. That they are pre-Christian seems to be suggested, as more or less similar ones have been observed on prehistoric implements, especially on two stone hatchets found by the late George O'Ffarthie under twelve or more spits of peat in his bog to the south of Oughterard, County Galway, and now in the collection of the Royal Irish Academy.

The cups on the Giant's Rock, Trimragh, represent the cups so often found in the County Donegal. Invariably one cup is so shallow as to be scarcely perceptible and the stones are called the "Giant's push stones," the six cups being supposed to be the marks of his fingers. I have got various numbers of cups —generally six or seven, sometimes more or less, but never five —usually on loose blocks, but in three or four places on the rock surface.

BARNES' INSCRIBED DALLÂNS, COUNTY DONEGAL.

By G. H. KINAHAN, M.R.I.A.

DALLÂNS are very numerous in this county: usually they are plain, a few having crosses on them or a few cups, but in the parish of Muff, near Londonderry, there is a more elaborate one described and figured in the "Proc. Roy. Hist. and Arch. Ass.,

Ireland," while a second is the King's Stone, Glendoen, west of Letterkenny, figured and described in the "Proceedings of the Royal Irish Academy."

Those to which attention is now directed occur north-west of Kilmacrenan, about a mile east of the south end of Barnesbeg (*Anglice*, little gap).

This seems anciently to have been a place of some note, as in the neighbourhood are the ruins of megalithic structures, such as Luscas (cave dwellings); Foslacs, or dwellings made of large flags or slabs; a so-called cromleac, having on the cover stone cups similar to those on a dolmen figured by Du Chaillu in the "Land of the Midnight Sun"; a cupped rock surface; the site of a Termon, or city of refuge, &c.

The large Barnes dallân stands a little to the southward of the smaller one; it is a massive flag seven feet high above the present surface, and about seven feet wide. The eastern face is extensively sculptured, principally cups, but in some places cups in saucers combined with furrows, as shown in rubbing No. 2 (Pl. IX, figs. 3 and 4).

At the left hand lower corner, half being below the present surface of the ground, is a curious combination of circles, furrows, and cup, of which No. 1 is a rubbing (Pl. IX, fig. 5).

Rubbing No. 3 is of the cups on the eastern face of the lesser dallân.

Rubbing No. 4 shows the marking on the western face of the lesser stone (Pl. IX, fig. 6); while No. 5 is a sketch of the lesser stone looking eastward, showing its full size above the original surface.

The smaller dallân seems to have been intentionally made and bevelled after the model of a spear head. This possibly may suggest that it was intended to represent a war god, or some such.

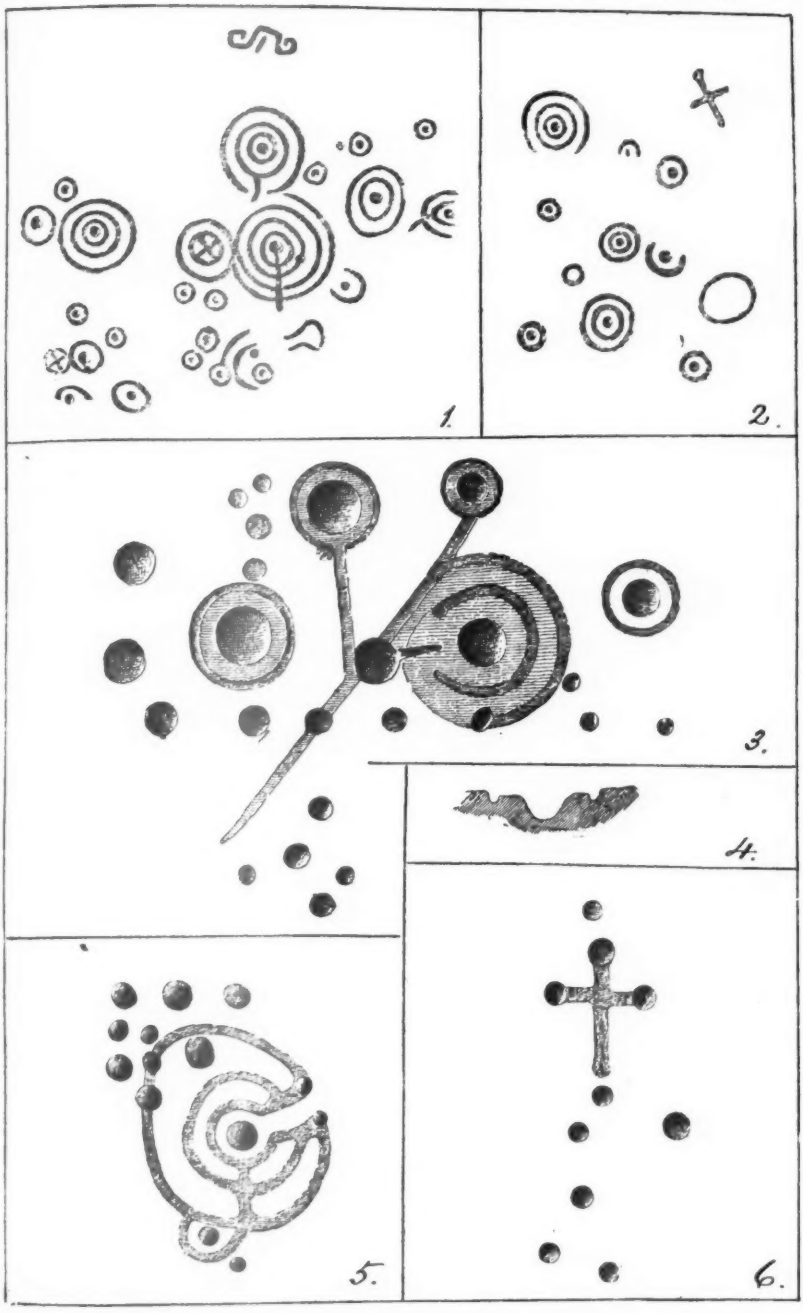
The cross on the western surface may possibly be more recent than the cups; it is, however, more or less of the same type as the Latin cross on No. 4 of the Mevagh rubbings. This cross, in miniature, has been faintly copied by some modern scribe on the western face of the large dallân, but the "old men" only cut two small cups on it.

Description of Plate IX.

Fig. 1. Inscribed rock surface at Mevagh, County Donegal, Ireland; showing groups of cups, circles, furrows, crosses, &c.

Fig. 2. Group of inscribed figures from rock surface at Mevagh, shewing a Latin cross.

Fig. 3. Inscribed figures from a large dallân, near Barnesbeg, County Donegal, showing cups, saucers, and furrows.



INSCRIPTIONS ON ROCK-SURFACES IN COUNTY DONEGAL, IRELAND.

Fig. 4. Transverse section of cup and saucer cut on the dallân.
Fig. 5. Group of circles, furrows, and cup, from the large dallân.
Fig. 6. Cross and cups on the small Barnes' dallân.

Discussion.

Mr. George M. Atkinson observed it was difficult from a rubbing to judge of the construction of the marks, whether cut, rubbed, or picked out of the surface of the rock. The weathering on the forms also may determine something. There can be no doubt as to these marks being the result of design, but no satisfactory explanation has yet been offered of their intention. It seems strange to find cup marks and rings on a vertical surface of a rock. The cross in some of the circles does not prove them Christian. Many monuments, as the Ogham stones, are so inscribed. The groove or channel from the centre cup always points down the slope of the rock, no matter what the number of the concentric ring marks may be. It is possible that they represent in a rude form, something analogous to the forms of the Indian Linga.

Mr. A. L. Lewis thought the large cross represented in fig. 6, Pl. IX, had been made to connect the cup-markings at some unknown interval of time after the latter were formed. The other crosses in the rubbings were of a different character, but he saw no reason to suppose that they were of Christian origin.

Miss Buckland pointed out that almost all the forms on the diagrams were to be found among the ancient American relics, the cross, in various forms, appearing constantly in American sculpturings on rocks and shells, evidently more ancient than the Spanish conquest, and, therefore, pre-Christian. Cup markings and concentric circles are also common on rocks and boulders in various parts of America, and although doubtless both there and in the old world these crosses and cup and ring markings had a symbolical and probably sacred meaning, yet the theory that when found in conjunction with other figures, as is frequently the case, they represent tribal or historic records seems worthy of consideration. An article on this subject in the "Smithsonian Contributions to North American Ethnology," Vol. V, 1882, brings together and compares these various markings from all parts of the world; and it will be seen that the cup and ring markings occur both in America and in Sweden, in connection with other figures evidently representing some historic event; and the same is brought out forcibly in some of the illustrations of Colonel Garrick Mallory's paper on "Pictographs of the North American Indians," in the "Annual Report of the Bureau of Ethnology," 1882-3.

Mr. G. H. Kinahan, in a written reply, has pointed out that the crosses on some at least of the Irish Oghams are more modern than the inscriptions—also that many Oghams are post-Christian. The "mark" mentioned in "The Book" was probably a cross, and that

it was an ancient Irish mark is proved by the cross on the Oughterard hatchet. In one system rubbing No. 2, Mevagh, and in two on No. 5, there are nearly horizontal furrows; in the latter, however, there are also vertical furrows. The knobs in place of cups in the centre of some of the systems would suggest that the scribing was done with a punch. The majority of the pre-historic structures in Northern Donegal are very similar to those of the Lapps; also the scribes are more er less similar to those in Northern Europe and America; while Donegal, when inhabited by the inscribers, must have had a climate very similar to that of the St. Lawrence of the present day; it may therefore be suggested that the early inhabitants were more or less like the Lapps and the Esquimaux and non-Christian.

On the INHABITANTS *of* PARAGUAY.

By DR. STEWART.[1]

DR. STEWART said it was very nearly thirty-two years since he left London for Paraguay, and he then travelled through it without any intention of remaining there; he had a good opportunity of noticing the state of the country and the character of the people and he found them most remarkable as a nation.

Paraguay was the first country on the River Plate settled by the Spaniards, who were at first met with hostility by the Indians, but who soon became friendly with the principal Caziques in the neighbourhood. The chief tribes were the Guaranis, who extended from the mouth of the River Plate to the River Amazon; not round the coast of the Atlantic, but straight across the South American continent, as was clearly to be seen from the names of places, and there were traces of them in Brazil also. The modern Guarani language differed from that which had been written by the Jesuit fathers, but which no Guarani of to-day could read. When the speaker first landed in Paraguay he found a state of things existing which seemed less like the civilisation of the 19th than of the 16th or 17th century. The Jesuits were driven out of the country about a century ago, but some of their work might be seen still; but he had never been able to find the fine churches and cathedrals which were spoken of in some books of travels; he had, indeed, been in many of the churches, but had found no pretension to fine art whatever in them. After the Jesuits left, there was no progress or change

[1] This was a verbal communication, of which the speaker left no record in the hands of the officers of the Institute. The present abstract of the remarks has been obligingly furnished by Mr. A. L. Lewis, who took notes of Dr. Stewart's address.

till after 1811, when the last Spanish Governor was deposed, which was done without any violence. Other men then came to the front, amongst them Dr. Francia, a most extraordinary man, who was educated at Cordova for the legal profession, and who exercised a most awful tyranny over the country for about thirty years; he imprisoned all the respectable people, especially the Spaniards, and when he could get no more money from them he had some of them brought out occasionally to the public square and shot. Of course the character of the people was affected by these proceedings, and one result was that they never ventured to express any opinion on political matters until after 1870, when the last of the Lopez residents was killed. The first Lopez succeeded Francia in 1840; he was a lawyer of rather mean origin, but he remained President until his death in 1862, when his eldest son succeeded him. These Presidents only encouraged foreigners and trade so far as they considered it necessary; Lopez preferred Englishmen to other foreigners, and induced the speaker (Dr. Stewart), to remain in the country to form a school of medicine; he was not so successful as he might have been, on account of the war which followed; he had about 160 students, nearly all of whom were killed in the war, together with some of the English doctors. The population before the war was 1,200,000, but afterwards it was under 200,000; at the beginning of the war from 25,000 to to 30,000 men would be engaged, but there were many drawn battles from which less than a third of the combatants returned. The soldiers lived very poorly, went almost naked, and underwent a very severe discipline, life being forfeited for what might be considered merely thoughtless actions. This arbitrary government, to which nothing was sacred, continued till 1870, when peace was restored, the country having been completely destroyed; there were no horses, cattle, fowls, cats, dogs, or anything left; everything had to be brought into the country afresh, the people who were left living meanwhile on fruits which they found in the woods, palms, oranges, &c., and continuing to die off from the effects of their long sustained misery and hardships. Since that time the country had been gradually recovering, and since 1880 the progress made has been remarkable.

The natives are quiet, hospitable, and inoffensive, and glad to see foreigners settling in the country; they are religious, truthful, honest, and grateful for anything that is done for them, and though they are said to be immoral, Dr. Stewart did not think they were so. The laws are good, and all codified, and there is complete liberty of conscience and perfect equality.

There are no full-blooded Guaranis to be found in Paraguay proper, all the natives having Spanish blood in their veins; but

Chaco, which is on the other side of the river, is populated by various tribes of Indians still untamed, and speaking different languages; D'Aubigné says they are all one nation, but Dr. Stewart found great differences in their skin colour, shape of head, position of eyes, and physiognomy generally, as well as in intelligence and language. This country has hardly been traversed by Europeans; eight years ago a Bolivian column crossed it into Paraguay, and from the calculations they made the population of the Grand Chaco must be between two and three millions.

Many of the people preserve purely Castilian features; the mixed races are a fine set of men, not as a rule tall, but rather under the average height, 5 feet 3 inches to 5 feet 5 inches being their average. They are very muscular and active, and just as much at home in the water as on the dry land.

No ancient buildings, such as are found in Central America, are known in Paraguay.

Several tribes of Indians are to be found in Paraguay, but they are not very numerous, and do not care to live among civilised people.

DISCUSSION.

Dr. SUMMERHAYES said that he had listened with much enjoyment to Dr. Stewart's interesting historical sketch of Paraguay, and of the natives of that isolated region, about which very little was known in England, but he considered that the statement made with regard to the security of life and property in Paraguay as compared with the neighbouring countries, was not altogether justified by the facts, inasmuch as, according to his experience, there was no more peaceable, orderly, and law-abiding country in the world than Brazil, where, in spite of the absence of a regular police, there was almost total immunity from serious crime in all the settled districts. He was, however, glad to be able to bear testimony to the essentially harmless character of the Indian tribes, where they were not systematically hunted down. The Guaranis, who formed the basis or chief stratum of the native population in Southern Brazil and in Paraguay, were only the southern branch of a much more widely spread Indian stock, the *Tupi* (or *Tupinamba*) race, as they were self-named. The word *Guarani* meant warrior, though the representatives of this race encountered by the original European settlers were the most peaceful of all the American races, there is no doubt but that other branches of the same family tree were among the most ferocious and most cannabalistic of all savage races. After the extraordinary depopulation of Paraguay during the war twenty-five years ago, principally through disease and famine, there must have been some amount of immigration of neighbouring tribes, but apparently there was little, if any, amount of negro intermixture in the present population as in Brazil.

ANTHROPOLOGICAL MISCELLANEA.

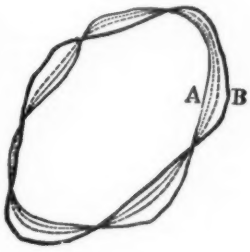
Personal Identification *and* Description.

By Francis Galton, F.R.S.

Being the substance of a lecture delivered at the Royal Institution on Friday, May 25th, 1888; reprinted from "Nature" of June 21st and 28th, after some slight revision by the Author.[1]

It is strange that we should not have acquired more power of describing form and personal features than we actually possess. For my own part I have frequently chafed under the sense of inability to verbally explain hereditary resemblances and types of features, and to describe irregular outlines of many different kinds, which I will not now particularise. At last I tried to relieve myself as far as might be from this embarrassment, and took considerable trouble, and made many experiments. The net result is that while there appear to be many ways of approximately effecting what is wanted, it is difficult as yet to select the best of them with enough assurance to justify a plunge into a rather serious undertaking. According to the French proverb, the better has thus far proved an enemy to the passably good, so I cannot go much into detail at present, but will chiefly dwell on general principles.

Fig. 1.



Measure of Resemblance.—We recognise different degrees of likeness and unlikeness, though I am not aware that attempts have as yet be made to measure them. This can be done if we take for our unit the *least discernible difference*. The application of this principle to irregular contours is particularly easy. Fig. 1 shows two such contours, A and B, which might be meteorological, geographical, or anything else. They are drawn with firm lines, but of different strengths for the sake of distinction. They contain the same area, and are so superimposed as to lie as fairly one over the other as may be. Now draw a broken contour which we will call C, equally sub-dividing the intervals between A and B; then C will

[1] The Council is indebted to the Editor of 'Nature" for the woodcuts illustrating this lecture.

be more like A than B was. Again draw a dotted contour, D, equally subdividing the intervals between C and A; the likeness of D to A will be again closer. Continue to act on the same principle until a stage is reached when the contour last drawn is undistinguishable from A. Suppose it to be the fourth stage; then as $2^4 = 16$, there are sixteen grades of least-discernible differences between A and B. If one of the contours differs greatly in a single or few respects from the other, reservation may be made of those peculiarities. Thus, if A has a deep notch in its lower right-hand border, we might either state that fact, and say that in other respects it differed from B by only sixteen grades of unlikeness, or we might make no reservation, and continue subdividing until all trace of the notch was smoothed away. It is purely a matter of convenience which course should be adopted in any given case. The measurement of resemblance by units of least-discernible differences is applicable to shades, colours, sounds, tastes, and to sense-indications generally. There is no such thing as infinite unlikeness, because the number of just discernible differences between any objects, however dissimilar, is always finite. A point as perceived by the sense of sight is not a mathematical point, but an object so small that its shape ceases to be discernible. Mathematically, it requires an infinitude of points to make a short line; sensibly, it requires a finite and not a large number of what the vision reckons as points, to do so. If from thirty to forty points were dotted in a row across the disk of the moon, they would appear to the naked eyes of most persons as a continuous line.

Description within Specified Limits.—It is impossible to verbally define an irregular contour with such precision that a drawing made from the description shall be undistinguishable from the original, but we may be content with a lower achievement. Much would be gained if we could refer to a standard collection of contours drawn with double lines, and say that the contour in question falls between the double lines of the contour catalogued as number so-and-so. This would at least tell us that none of the very many contours that fell outside the specified limits could be the one to which the description applied. It is an approximate and a negative method of identification. Suppose the contour to be a profile, and for simplicity's sake let us suppose it to be only the portion of a profile that lies below the notch that separates the brow from the nose, and extending only so far downwards as the parting between the lips. Suppose it also to be the mere outline of a shadow sharply cast upon the wall by a single source of light, such as is excellently seen when a person stands sideways between the electric lantern and the screen in a lecture-room. All human profiles of this kind, when they have been reduced to a uniform vertical scale, fall within a small space. I have taken those given by Lavater, which are in many cases of extreme shapes, and have added others of English faces, and find that they all fall within the space shown in Fig. 2. The outer and inner limits of the space are, of course, not the profiles of any real faces, but the limits of many profiles, some of which

are exceptional at one point, and others at another. We can classify the great majority of profiles so that each of them shall be included between the double borders of one, two, or some small number of standard portraits, such as Fig. 3. I am as yet unprepared to say how near together the double borders of such standard portraits should be drawn; in other words, what is the smallest number of grades of unlikeness that we can satisfactorily deal with. The process of sorting profiles into their proper classes and of gradually building up a well-selected standard collection, is a laborious undertaking if attempted by any obvious way; but I believe it can be effected with comparative ease on the basis of measurements, as will be explained later on, and by an apparatus that will be described.

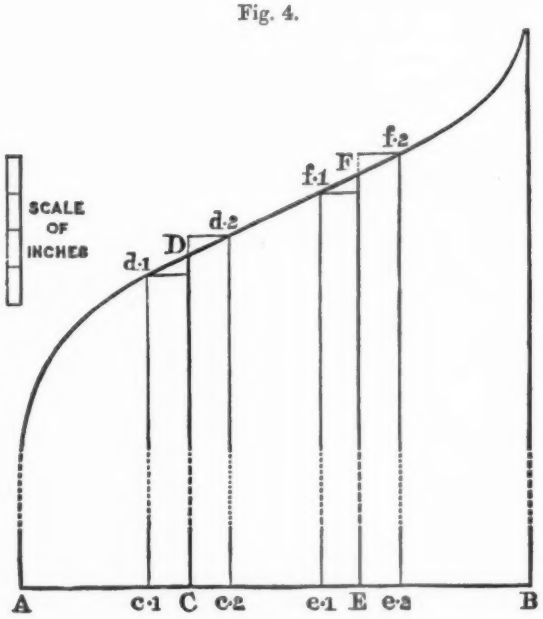
Fig. 2. Fig. 3.

Classification of Sets of Measures.—Prisoners are now identified in France by the measures of their heads and limbs, the set of measures of each suspected person being compared with the sets that severally refer to each of many thousands of convicts. This idea, and the practical application of it, is due to M. Alphonse Bertillon. The actual method by which this is done is not all that could be theoretically desired, but it is said to be effective in action, and enables the authorities quickly to assure themselves whether the suspected person is or is not an old malefactor. The primary measures in the classification are four—namely, the head length, head breadth, foot length, and middle-finger length of the left foot and hand respectively. Each of these is classified according as it is large, medium, or small. There are thus three, and only three, divisions of head lengths, each of which is subdivided into three divisions of head breadth; again, each of these is further subdivided into three of foot length, and these again into three of middle-finger length; thus the number of primary classes is equal to three multiplied into itself four times—that is to say, their number is eighty-one, and a separate pigeon hole is assigned to each. All the exact measures and other notes on each criminal are written on the same card, and this card is stored in its appropriate pigeon-hole. The contents of each pigeon-hole are themselves sub-sorted on the same principle of three-fold classification in respect to other measures. This process can, of course, be extended indefinitely; but how far it admits of being carried on advantageously is another question. The fault of all hard-and-fast lines of classification, when variability is continuous, is the doubt where to place and where to look for values that are near the limits between two adjacent classes. Let us take Stature as an illustration of what must occur in every case, and let us represent its distribution by what I have called a "Scheme," as shown in Fig. 4.

Here the statures of any large group of male adults such as those whom I had measured by the thousand at the International

Health Exhibition of 1884, are represented by lines of proportionate length. The lines are arranged side by side at equal distances apart on a base, A B, of convenient length. A curve drawn through their tops gives the upper boundary of the scheme; the lines themselves are then wiped out, having served their purpose. If the base A B be divided into three equal parts, and perpendiculars, C D, E F, be erected at the divisions between them, reaching from the base upwards to the curve, then the lengths of those perpen-

Fig. 4.



diculars will be proportionate to the limiting values between the small and the medium group, and between those of the medium and the large group respectively. I find the difference between these perpendiculars in the case of stature to be about 2·3 inches. In other words, the shortest and tallest men in the medium class differ only by 2·3 inches. We have next to consider how much ought reasonably to be allowed for error of measurement. Considering that a man differs in height by a full third of an inch between the time of getting up in the morning and lying down at night: considering also that measures are recorded to the nearest tenth of an inch at the closest, also the many uncertainties connected with the measurement of stature, it would be rash not to allow for a possible (I do not say "probable") and not rare error of at least $\pm$ half-an-inch. Prolong C D, and note the points upon it at the distance of half-an-inch above and below D; draw horizontal lines from those points to meet the curve at *d*.1, *d*.2, and from

the points of intersection drop perpendiculars reaching the base at *c*.1, *c*.2. A similar figure is drawn at F. Then the ratio borne by the uncertain entries to the whole number of entries is as $c_1\ c_2 + e_1\ e_2$ to A B. This, as seen by the diagram, is a very large proportion. There is a dilemma from which those who adopt hard-and-fast lines of classification cannot escape: either the fringe of uncertainty must be dangerously wide, or else the delicacy with which measures are made cannot be turned to anything like its full account. If the delicacy of the measurement is small, each of the fringes of uncertainty must be very wide: if the delicacy is great, the summed widths of all the fringes will be narrow, if there are only a few classes; but, by having only a few classes, most of the advantages of possessing delicate observations are wasted. The bodily measurements are so dependent on one another that we cannot afford to neglect small distinctions in an attempt to make an effective classification. Thus long feet and long middle-fingers usually go together. We therefore want to know whether the long feet in some particular person are accompanied by very long, or moderately long, or barely long fingers, though the fingers may in all three cases have been treated as long in M. Bertillon's system of classes, because they would be long as compared with those of the general population. Certainly his eighty-one combinations seem far from being equally probable. The more numerous the measures the greater would be their inter-dependence, and the more unequal would be the distribution of cases among the various possible combinations of large, small, and medium values. No attempt has yet been made to estimate the degree of their interdependence. I am therefore having the above measurements (with a slight necessary variation) recorded at my anthropometric laboratory for the purpose of doing so. This laboratory, I may add, is now open to public use under reasonable restrictions. It is entered from the Science Collections in the Western Galleries at South Kensington.

Mechanical Selector.—Feeling the advantage of possessing a method of classification that did not proceed upon hard-and-fast lines, I contrived an apparatus that is quite independent of them, and which I call a mechanical selector. Its object is to find which set, out of a standard collection of many sets of measures, resembles any one given set within any given degree of unlikeness. No one measure in any of the sets selected by the instrument can differ from the corresponding measure in the given set by more than a specified value. The apparatus is very simple; it applies to sets of measures of very description, and ought to act on a large scale as well as it does on a small one, with great rapidity, and be able to test several hundred sets by each movement. It relieves the eye and brain from the intolerable strain of tediously comparing a set of many measures with each of a large number of successive sets, in doing which a mental allowance has to be made for a *plus* or *minus* deviation of a specified amount in every entry. It is not my business to look after prisoners, and I do not fully know what

need may really exist for new methods of quickly identifying suspected persons. If there be any real need, I should think that this apparatus, which is contrived for other purposes, might, after obvious modifications, supply it.

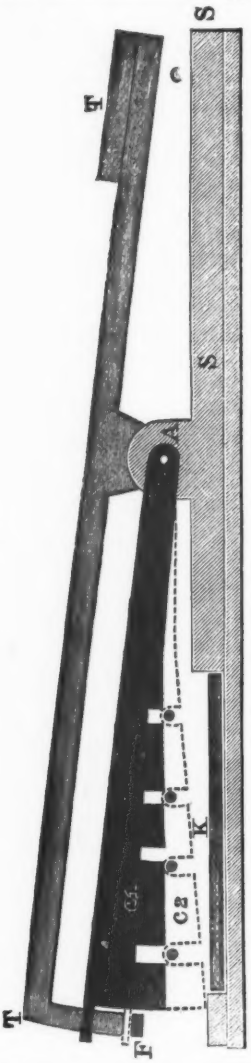


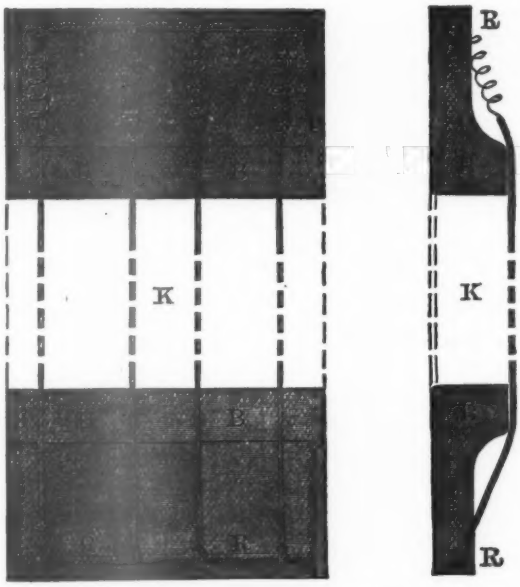
Fig. 5.

Section of the apparatus, but the bridges and rods are not shown, only the section of the wires.

The apparatus consists, in principle, of a large number of strips of card or metal *c* 1, *c* 2 (fig. 5), say 8 or 9 inches long, and having a common axis A passing through all their smaller ends. A tilting-frame T, which turns on the same axis, has a front cross-bar F (whose section is seen in fig. 5), on which the tips of the larger ends of all the cards rest whenever the machine is left alone. In this condition a counterpoise at the other end of T suffices to overcome the weight of all the cards, and this heavier end of T lies or the base-board S. When the heavy end of T is lifted, as shown in fig. 5, its front-bar F is of course depressed, and the cards being individually acted on by their own weights, are free to descend with the cross-bar unless they are otherwise prevented. The lower edge of each card is variously notched to indicate the measures of the person it represents. Only four notches are shown in the figure, but six could be employed in a card of 8 or 9 inches long, allowing compartments of 1 inch in length to each of six different measures. The position of the notch in the compartment allotted to it, indicates the corresponding measure according to a suitable scale. When the notch is in the middle of a compartment, it means that the measure is of mediocre amount; when at one end of it, the measure is of some specified large value or of any other value above that; when at the other end, the measure is of some specified small value, or of any other value below it. Intermediate positions represent intermediate values according to the scale. Each of the cards corresponds to one of the sets of measures in the standard collection. The set of measures of the given person

are indicated by the positions of parallel strings or wires, one for each measure, that are stretched between rods and across bridges at either end of a long board set cross-ways to the cards. Their positions on the bridges are adjusted by the same scale as that by which the notches were cut in the cards. Figs. 6*a* and 6*b* are views of this portion of the apparatus, which acts as a key, and is of about 30 inches in effective length. The whole is shown in working position in fig. 7. When the key is slid into its place, and the heavy end of the tilting-frame T is raised, all the cards are free to descend so far as the tilting frame is concerned, but they

Fig. 6*a*. Fig. 6*b*.

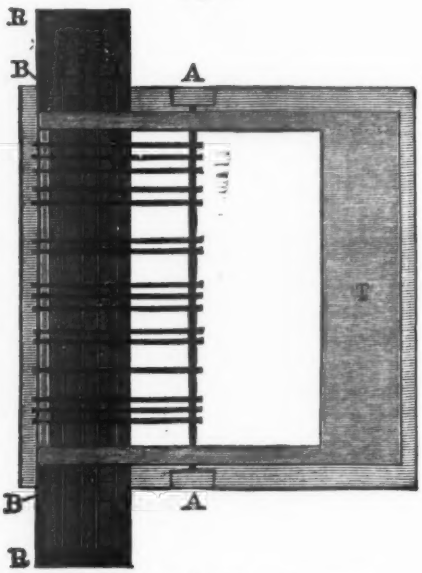


Plan and section of the key-board K.

are checked by one or more of the wires from descending below a particular level, except those few, if any, whose notches correspond throughout to the positions of the underlying wires. This is the case with the card *c*2 (fig. 5), drawn with a dotted outline, but not with *c*1, which rests upon the third wire, counting from the axis. As the wires have to sustain the weight of all or nearly all the cards, frequent narrow bridges must be interposed between the main bridges to sustain the wires from point to point. The cards should be divided into batches by partitions corresponding to these interposed bridges, else they may press sideways with enough friction to interfere with their free independent action. The action is improved by interposing stretched threads between each pair of adjacent cards

so that every card works in a separate compartment. None of these are shown in the figure. The method of adjusting the wires there shown, is simply by sliding the rings to which they are

Fig. 7.



Reduced plan of complete apparatus.

Explanation.—A, the common axis ; c_1, c_2, the cards ; T, tilting-frame, turning on A (the cards rest by their front ends on F, which is the front cross-bar of T, at the time when the heavy hinder end of T rests on the base-board S) ; K is the key-board ; R R are the rods between which the wires are stretched ; B B are the bridges at either end of the key-board, over which the wires pass. (The explanation refers to the other figs., as well as to this).

attached at either end, along the rod which passes through them. It is easy to arrange a more delicate method of effecting the adjustment if desired. Hitherto I have snipped out the notches in the cards with a cutter made on the same principle as that used by railway guards in marking the tickets of travellers. The width of the notch is greater than the width of the wire by an amount proportionate to the allowance intended to be made for error of measurement, and also for that due to mechanical misfit. There seems to be room for 500 cards or metal strips, and ample room for 200 or 300 of them, to be arranged in sufficiently loose order within the width of 30 inches. A key of that effective length would test all these by a single movement; it could also be applied in quick succession to any number of other sets of cards.

Measurement of Profiles.—The sharp outline of a photographed profile admits of more easy and precise measurement than the yield-

ing outline of the face itself. The measurable distances between the profiles of different persons are small, but the available measures are much more numerous than might have been expected, and their variations are more independent of one another than those of the limbs. I suspect that measures of the profile may be nearly as trustworthy as those of the limbs for approximate identification, that is, for excluding a very large proportion of persons from the possibility of being mistaken for the individual whose measurements are given. The measurement of a profile enables us to use a mechanical selector for finding those in a large standard collection to which they nearly correspond. From the selection thus made, the eye could easily make a further selection of those that suited best in other respects. A mechanical selector also enables us to quickly build up a standard collection step by step, by telling us whether or no each fresh set of measures falls within the limits of any of those already collected. If it does, we know that it is already provided for; if not, a new card must be added to the collection. There will be no fear of duplications, as every fresh-added standard will differ from all its predecessors by more than the specified range of permitted differences.

As regards the most convenient measurements to be applied to a profile for use with the selector, I am unable as yet to speak decidedly. If we are dealing merely with a black silhouette, such as the shadow cast on a wall by a small and brilliant light, the best line from which to measure seems to be B C in fig. 8; namely, that which touches both the concavity of the notch between the brow and nose, and the convexity of the chin. It is not difficult to frame illustrated instructions to explain what should be done in the cases where no line can be drawn that strictly fulfils these conditions. I have taken a considerable number of measures from the line that touches the brow and chin, but am now inclined to prefer that which I have just described. A sharp unit of measurement is given by the distance between this line and another drawn parallel to it just touching the nose, as at N in the figure. A small uncertainty in the direction of B C has but a very trifling effect on this distance. By dividing the interval between these parallel lines into four parts, and drawing a line through the third of the divisions, parallel to B C, we obtain the two important points of reference, M and R. M is a particularly well-defined point, from which O is determined by dropping a perpendicular from M upon B C. O seems the best of all points from which to measure. It is excellently placed for defining the shape and position of the notch between the nose and the upper lip, which is perhaps the most distinctive feature in the profile. O L can be determined with some precision; O B and O C are but coarse measurements.

Fig. 8.

In addition to these and other obvious measures, such as one or more to define the projection of the lips, it would be well to mea-

sure the radius of the circle of curvature of the depression at B, also of that between the nose and the lip, for they are both very variable and very distinctive. So is the general slope of the base of the nose. The difficulty lies not in selecting a few measures that will go far towards negatively identifying a face, but in selecting the best—namely, those that can be most precisely determined, are most independent of each other, most variable, and most expressive of the general form of the profile. I have tried many different sets, and found all to be more or less efficient, but have not yet decided to my own satisfaction which to adopt.

We will now suppose that either by the above method or by any other, a standard collection of doubly outlined portraits such as that in fig. 3, has been made and come into use, so that a profile can be approximately described by referring it to number so-and-so in the catalogue. If the number it contained was less than 1,000, three figures would suffice to define any one of them. We will now consider how a yet closer description of the profile may be given by using a few additional figures. One way of doing so is to have short cross-lines drawn at critical positions between the two outlines of the standard, and to suppose each of them to be divided into eight equal parts. The intersection of the cross-lines with the outer border would count as 0; that with the inner border as 8; and the intermediate divisions from 1 to 7. As the cross-lines would be very short, a single numeral would thus define the position of a point in any one of them, with perhaps as much precision as the naked eye could utilise. By employing as many figures as there are cross-lines in the standard, each successive figure for each successive cross-line, a corresponding number of points in the profile would be fixed with great accuracy. Suppose a total of nine figures to be allowed, then the first three figures would specify the catalogue number of the portrait to be referred to, and the remaining six figures would determine six points in the outline of the portrait with greatly increased precision.

I may say that after numerous trials of different methods for comparing portraits successively by the eye, I have found none so handy and generally efficient as a double-image prism, which I largely used in my earlier attempts in making composite portraits.

I have not succeeded in contriving an instrument that shall directly compare a given profile with those in a standard collection, and which shall at the same time act with anything like the simplicity of a mechanical selector, and with the same quick decision in acceptance or rejection. Still, I recognise some waste of opportunity in not utilising the power of varying the depths of the notches in the cards, independently of their longitudinal position.

Personal Characteristics.—These are to be found in much more minute portions of the body than those just described. Leaving aside microscopic peculiarities, which are of unknown multitudes, such as might be studied in the 800,000,000 specimens cut by a microtome, say of one two-thousandth part of an inch in thickness,

and one-tenth of an inch each way in area, out of the 4,000 cubic inches or so of the flesh, fat, and bone of a single average human body, there are many that are visible with or without the aid of a lens.

The markings in the iris of the eye are of the above kind. They have been never adequately studied, except by the makers of artificial eyes, who recognise thousands of varieties of them. These markings well deserve being photographed from life on an enlarged scale. I shall not dwell now upon these, nor on such peculiarities as those of handwriting, nor on the bifurcations and interlacements of the superficial veins, nor on the shape and convolutions of the external ear. They all admit of brief approximate description by the method just explained—namely, by reference to the number in a standard collection of the specimen that shall not differ from it by more than a specified number of units of unlikeness. I have already explained what is meant by a unit of unlikeness, and the mechanical means by which a given set of measures can be compared with great ease with every set in a standard collection of sets of measures.

Perhaps the most beautiful and characteristic of all superficial marks are the small furrows, with the intervening ridges and their pores, that are disposed in a singularly complex yet regular order on the under surfaces of the hands and the feet. I do not now speak of the the large wrinkles in which chiromantists delight, and which may be compared to the creases in an old coat, or to the deep folds in the hide of a rhinoceros, but of those fine lines of which the buttered fingers of children are apt to stamp impressions on the margins of the books they handle, that leave little to be desired on the score of distinctness. These lines are found to take their origin from various centres, one of which lies in the under surface of each finger-tip. They proceed from their several centres in spirals and whorls, and distribute themselves in beautiful patterns over the whole palmar surface. A corresponding system covers the soles of the feet. The same lines appear with little modification in the hands and feet of monkeys. They appear to have been carefully studied for the first time by Purkinje in 1822, and since then they have attracted the notice of many writers and physiologists, the fullest and latest of whom is Kollman, who has published a pamphlet, "Tastapparat der Hand" (Leipzig, 1883), in which their physiological significance is fully discussed. Into that part of the subject I am not going to enter here. It has occurred independently to many persons to propose finger-marks as a means of identification. In the last century, Bewick, in one of the vignettes in the "History of Birds," gave a woodcut of his own thumb-mark, which is the first clear impression I know of, and afterwards one of his finger-marks. Some of the latest specimens that I have seen are by Mr. Gilbert Thomson, an officer of the American Geological Survey, who, being in Arizona, and having to make his orders for payment on a camp suttler, hit upon the expedient of using his own thumb-mark to serve the

same purpose as the elaborate scroll engraved on blank cheques—namely, to make the alteration of figures written on it impossible without detection. I possess copies of two of his cheques. A San Francisco photographer, Mr. Tabor, made enlarged photographs of the finger-marks of Chinese, and his proposal to employ them as a means of identifying Chinese immigrants, seems to have been seriously considered. I may say that I can obtain no verification of a common statement that the method is in actual use in the prisons in China. The thumb-mark has been used there as elsewhere to form a manual impression in attestation of deeds, such as a man might make with a common seal, not his own, and say, "This is my act and deed;" but I cannot hear of any elaborate system of finger-marks having ever been employed in China for the identification of prisoners. It was, however, largely used in India, by Sir William Herschel, many years ago, when he was an officer of the Bengal Civil Service. He found it to be most successful in preventing personation, and in putting an end to disputes about the authenticity of deeds. He described his method fully in "Nature," in 1880 (Vol. xxiii, p. 76), which should be referred to; also a paper by Mr. Faulds in the next volume. I may in addition allude to articles in the American journal "Science," 1886 (Vol. viii, pp. 166 and 212).

The question arises whether these finger-marks remain unaltered throughout the life of the same person. In reply to this, I am enabled to submit a most interesting piece of evidence, which thus far is

Fig. 9.

Enlarged impressions of the fore and middle finger tips of the right hand of Sir William Herschel, made in the year 1860.

unique, through the kindness of Sir Wm. Herschel. It consists of the imprints of the two first fingers of his own hand, made in 1860

and in 1888 respectively—that is, at periods separated by an interval of twenty-eight years. I have also two intermediate imprints, made by him in 1874 and in 1883 respectively. Figs. 9 and 11 are cut from photographs on an enlarged scale of the imprints of 1860 and 1888, which were made direct upon the engraver's block; these woodcuts may therefore be relied on as being very correct representations of the originals in my present possession. Fig. 10 refers to the portion of fig. 9 to which I am about to draw attention. On first examining these and other finger-marks, the eye wanders and becomes confused, not knowing where to fix itself; the points shown in fig. 10 are those which it ought to select. They are the places

Fig. 10.

Positions of furrow-heads and bifurcations of furrows, in Fig. 9.

Fig. 11.

Enlarged impressions of the fore and middle finger tips of the right hand of Sir William Herschel, made in the year 1888.

at which each new furrow makes its first appearance. The furrows may originate in two principal ways, which are not always clearly

distinguishable: (1) the new furrow may arise in the middle of a ridge; (2) a single furrow may bifurcate and form a letter Y. The distinction between (1) and (2) is not greatly to be trusted, because one of the sides of the ridge in case (1) may become worn, or be narrow and low, and not always leave an imprint, thus converting it into case (2); conversely case (2) may be converted into case (1). The position of the origin of the new furrow is, however, none the less defined. I have noted the furrow-heads and bifurcations of furrows in fig. 9, and shown them separately in fig. 10. The reader will be able to identify these positions with the aid of a pair of compasses, and he will find that they persist unchanged in fig. 11, though there is occasionally some uncertainty between cases (1) and (2). Also there is a little confusion in the middle of the small triangular space that separate two distinct systems of furrows, much as eddies separate the stream lines of adjacent currents converging from opposite directions. A careful comparison of figs. 9 and 11 is a most instructive study of the effects of age. There is an obvious amount of wearing and of coarseness in the latter, but the main features of both are the same.

I happen to possess a little apparatus that proves very convenient for examining finger-marks and for recording the positions of furrow heads. It is a slight and small, but well-made wooden pentagraph, multiplying five-fold, in which a very low-power microscope, with *coarse* cross-wires, forms the axis of the short limb, and a pencil-holder forms the axis of the long limb. I contrived it for quite another use—namely, the measurements of the length of wings of moths in some rather extensive experiments that are now being made for me in pedigree moth-breeding. It has proved very serviceable in this inquiry also, and was much used in measuring the profiles spoken of in the last article. Without some moderate magnifying power the finger-marks cannot be properly studied. It is a convenient plan, in default of better methods, to prick holes with a needle through the furrow-heads into a separate piece of paper, where they can be studied without risk of confusing the eye. There are peculiarities often found in furrows that do not appear in these particular specimens, and to which I will not further refer. In fig. 10 the form of the origin of the spirals is just indicated. These forms are various; they may be in single or in multiple lines, and the earlier turns may form long loops or be nearly circular. My own ten fingers show at least four distinct varieties.

Notwithstanding the experience of others to the contrary, I find it not easy to make clear and perfect impressions of the fingers. The proper plan seems to be to cover a flat surface, like that of a piece of glass or zinc, with a thin and even coat of paint, whether it be printers' ink or Indian ink rubbed into a thick paste, and to press the finger lightly upon it so that the ridges only shall become inked, then the inked fingers are pressed on smooth and slightly damped paper. If a plate of glass be smoked over a paraffin lamp, a beautiful negative impression may be made on it by the finger,

suitable for a lantern transparency. The blackened finger may afterwards be made to leave a positive impression on a piece of paper, that must be varnished if the impression is to be rendered permanent. All this is rather dirty work, but people do not seem to object to it; rivalry and the hope of making continually better impressions carries them on. It is troublesome to make plaster casts; modelling-clay has been proposed; hard wax, such as dentists use, acts fairly well; sealing-wax is excellent if the heat can be tolerated; I have some good impressions in it. For the mere study of the marks, no plan is better than that of rubbing a little thick paste of chalk ("prepared chalk") and water or sized water upon the finger. The chalk lies in the furrows, and defines them. They might then be excellently photographed on an enlarged scale. My own photographic apparatus is not at hand, or I should have experimented on this. When notes of the furrow-heads and of the initial shape of the spiral have been made, the measurements would admit of comparison with those in catalogued sets by means of a numerical arrangement, or even by the mechanical selector described above. If a cleanly and simple way could be discovered of taking durable impressions of the finger tips, there would be little doubt of their being serviceable in more than one way.

In concluding my remarks, I should say that one of the inducements to making these inquiries into personal identification has been to discover independent features suitable for hereditary investigation. It has long been my hope, though utterly without direct experimental corroboration thus far, that if a considerable number of variable and independent features could be catalogued, it might be possible to trace kinship with considerable certainty. It does not at all follow because a man inherits his main features from some one ancestor, that he may not also inherit a large number of minor and commonly overlooked features from many ancestors. Therefore it is not improbable, and worth taking pains to inquire, whether each person may not carry visibly about his body undeniable evidence of his parentage and near kinships.

Postscript.

Since delivering this lecture, I have had the opportunity of seeing M. Bertillon's system in operation at Paris, and was much impressed with the skill and celerity shown by his staff of assistants, with the large amount of work got through, and with the practical overcome of theoretical difficulties, especially in the method of subsorting cards in the movable trays, which are, in fact, the "pigeon holes." Numerous data methodically inscribed on each card, in addition to the primary measures and the free use of coloured tickets to aid in the subdivisions, make it easy to a practised person to hunt rapidly through the contents of any one tray. These additional data include a notice of scars and personal marks, and very good photographs of the profile and full face.

The "Longstone" at Mottistone, Isle of Wight.

To the Editor of the "Journal of the Anthropological Institute."

Dear Sir,

There is a short description of the "Longstone" at Mottistone, in the Isle of Wight, in a paper of mine which was published in the Journal for August, 1884. I there state that the "Longstone" is an upright stone, having a large flat stone (9 feet × 4 feet × 2 feet) lying on the north-east side of it, which I thought might have been slightly moved from its original position. On revisiting the stones last June I found that the flat stone had been shifted about ten feet, and that it now lies to the south-east and not to the north-east of the upright stone. Whether anyone has been digging there, and, if so, whether anything has been found, I do not know; but I think the change in the position of the stone is worth noting on its own account, and I am the more anxious that it should be noted in our Journal, since any of its readers going to the stones with my description in their hands might suppose that I had made a mistake; my original sketches, however, clearly show that this is not the case. I am, dear Sir, yours truly,

A. L. Lewis.

Anthropometric Statistics from Amherst College, Mass., U.S.A.

In the last Volume (xvii) of this Journal, at page 357, will be found a reprint of a brief account of the mean anthropometric results obtained at the gymnasium of Amherst College, Amherst, Mass., U.S.A., by Prof. E. Hitchcock, M.D. His observations refer to so unusual a variety of characteristics, carefully made by the same methods and instruments, and applied to so homogeneous a group, that more detailed accounts would have been very welcome to anthropologists. They would serve, at least, two purposes, the one to show the average variability of each characteristic, and the other to show their interdependence. With a view of determining the first of these objects, I wrote to Dr. Hitchcock, urging the preparation of tables, drawn up in the form by which the distribution of any faculty among the individual members of a group is usually expressed. He responded most cordially to my suggestion, and specially prepared the following tables in manuscript, which are here published, preceded by extracts from his accompanying letter.

Francis Galton.

"I have at length made out the mean tables of thirteen items, which were suggested as appropiate for study by you.

"By a little error I have not got the same number of observations on each item, but this is because I did not get the maximum and minimum of my whole records for a basis, but inadvertently took those for only one college year, and this unfortunately did not cover every case. "Edward Hitchcock."

HEIGHT OF BODY. (*In Millimètres*).

Years.	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	Total.
16	0	0	1	0	0	0	2	0	1	0	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	12
17	0	0	1	2	1	0	1	0	2	3	4	4	5	6	1	1	1	2	3	3	2	0	0	0	0	1	0	0	0	0	0	45
18	0	0	3	1	0	4	2	6	2	3	2	7	6	7	11	6	8	4	4	5	2	2	2	1	0	1	1	0	0	0	0	91
19	0	0	3	0	4	2	0	4	2	4	2	6	13	14	6	8	10	7	6	2	3	2	3	3	0	1	1	1	0	0	0	121
20	0	0	2	2	3	2	2	7	8	5	4	19	7	14	4	7	4	7	10	5	4	5	3	1	1	2	0	1	0	0	0	130
21	0	1	2	3	3	2	3	6	5	3	4	3	9	12	10	7	6	5	3	4	4	3	1	1	1	1	1	0	0	0	0	109
22	1	0	1	0	1	2	0	5	3	1	0	2	4	11	4	5	7	6	3	1	0	1	0	1	1	0	1	0	0	0	0	74
23	0	0	0	1	0	1	2	1	2	1	2	2	3	2	3	1	4	1	0	4	1	0	1	1	0	0	0	0	0	0	1	30
24	0	0	0	0	2	1	1	2	1	2	2	0	2	1	0	1	6	0	0	3	1	1	1	1	0	0	0	0	0	0	0	33
25	0	0	0	0	0	0	1	0	1	0	2	0	2	2	0	1	0	0	0	0	0	2	1	1	0	0	1	0	0	0	0	11
26	0	0	0	0	0	0	1	0	0	0	3	0	1	1	2	1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	14
Total	1	10	11	17	14	11	31	31	33	34	31	49	63	57	37	41	49	27	27	28	16	16	9	10	3	7	3	3	0	0	1	670

HEIGHT OF NAVEL. (*In Millimètres.*)

Years.	920	930	940	950	960	970	980	990	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	Total.
16	0	0	0	0	0	1	2	1	0	0	1	0	1	1	2	0	1	0	1	0	0	0	0	0	0	0	11
17	0	0	0	3	0	0	2	5	1	2	7	8	2	7	2	2	3	0	2	0	0	0	0	0	0	1	47
18	0	0	2	2	0	1	5	4	5	5	14	6	9	11	8	6	4	4	4	0	1	1	0	1	0	0	94
19	1	0	2	3	1	5	5	5	5	11	13	9	10	9	11	6	5	4	5	4	0	2	1	0	1	1	121
20	0	1	1	3	7	5	4	3	10	10	15	12	12	8	15	6	7	6	1	2	2	2	0	1	0	1	132
21	1	0	1	3	3	5	3	4	6	11	18	10	6	1	3	6	6	4	4	2	2	2	1	0	0	0	107
22	0	1	2	0	1	2	2	2	6	9	7	8	7	1	5	3	5	1	0	1	0	0	0	0	0	0	74
23	0	0	0	0	2	2	1	2	1	3	8	7	0	2	6	0	3	1	0	2	0	1	0	0	0	0	29
24	0	0	0	0	2	3	2	2	4	4	2	2	2	2	3	2	4	0	0	2	2	0	0	0	0	0	33
25	0	0	1	0	1	1	2	1	0	2	2	2	1	0	0	1	0	1	0	2	0	0	1	0	0	0	11
26	0	0	0	0	1	1	1	1	1	1	2	2	0	0	2	1	1	0	0	1	0	0	1	1	0	0	14
Total	2	3	11	14	18	29	33	31	39	56	82	60	49	41	57	35	40	21	17	14	7	6	4	3	0	3	673

Height of Knee. (*In Millimètres.*)

Years.	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	Total.
16	0	0	0	0	3	3	0	2	1	0	2	1	1	0	0	0	0	13
17	0	1	0	5	4	7	7	5	6	3	4	1	1	0	0	0	1	45
18	1	2	2	6	9	8	12	18	19	16	5	3	1	1	1	1	0	95
19	0	2	5	8	14	11	20	22	12	7	10	8	2	0	0	0	0	121
20	0	1	8	9	9	16	26	20	18	9	9	3	2	0	1	1	0	132
21	0	1	2	17	15	12	12	18	13	5	8	7	2	0	0	0	0	107
22	1	1	5	3	10	10	9	12	8	10	1	2	1	0	0	0	0	72
23	0	1	1	1	7	1	4	2	5	4	1	0	0	2	0	0	0	30
24	0	0	2	0	5	4	5	3	6	1	2	1	4	0	0	0	0	33
25	0	0	2	1	1	1	0	2	1	1	0	2	0	0	0	0	0	11
26	0	1	0	0	2	0	3	3	1	1	0	1	0	1	0	0	1	14
Total	2	10	27	50	79	73	98	107	90	57	42	29	14	4	2	2	2	673

Sitting Height. (*In Millimètres.*)

Years.	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990	1000	Total.
16	0	0	0	0	0	1	1	1	1	2	0	3	0	1	0	0	1	0	0	0	0	11
17	0	0	0	0	2	1	4	5	4	7	7	8	1	2	2	2	1	0	0	0	0	46
18	0	0	0	0	1	2	4	8	13	7	15	11	9	7	9	2	2	2	0	0	0	92
19	0	0	1	1	4	0	3	14	17	11	21	16	11	11	3	1	4	0	2	0	0	120
20	2	1	0	1	1	2	4	13	15	13	16	13	18	14	5	10	0	2	0	0	1	131
21	0	0	1	0	0	2	3	7	11	14	14	14	14	20	2	4	2	2	0	0	0	110
22	0	0	1	0	1	5	3	4	6	8	10	8	10	6	5	5	2	0	0	0	0	74
23	0	0	0	1	0	2	2	2	2	4	4	2	1	5	1	2	1	0	1	0	1	31
24	0	0	0	0	1	0	1	2	6	5	3	2	6	5	2	0	0	0	0	0	0	33
25	0	0	0	0	0	0	1	0	1	1	1	1	4	0	1	0	1	0	0	0	0	11
26	0	0	0	0	0	0	0	1	0	1	3	1	3	3	1	0	1	0	0	0	0	14
Total	2	1	3	3	10	15	26	57	76	73	94	79	77	74	31	26	15	6	3	0	2	673

Girth of Head. (*In Millimètres.*)

Years.	530	535	540	545	550	555	560	565	570	575	580	585	590	595	600	605	610	615	620	Total.
16	1	0	0	0	2	0	1	4	1	0	1	1	0	0	0	0	0	0	0	11
17	2	0	1	2	3	8	9	5	7	1	4	2	2	0	0	0	0	0	0	46
18	0	1	3	6	6	12	13	7	14	9	10	6	1	3	1	2	0	0	0	94
19	1	0	3	6	10	11	23	12	17	14	6	5	9	0	4	1	0	0	0	122
20	1	0	4	6	9	8	20	11	26	9	16	11	7	2	2	0	0	0	0	132
21	0	0	4	4	5	10	13	12	21	11	6	11	5	3	4	0	1	0	1	111
22	0	0	2	3	3	6	14	6	15	9	8	4	0	1	3	1	0	0	0	75
23	0	1	0	0	3	3	5	2	8	4	2	2	0	0	1	0	0	0	0	31
24	0	0	0	0	4	1	6	2	6	6	4	3	0	0	1	0	0	0	0	33
25	0	0	0	0	0	0	3	0	1	2	1	1	2	0	1	0	0	0	0	11
26	0	0	0	0	1	0	2	0	4	2	3	2	0	0	0	0	0	0	0	14
Total	5	2	17	27	46	59	109	61	120	67	61	48	26	9	17	4	1	0	1	680

Breadth of Head. (*In Millimètres.*)

Years.	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	Total.
16	1	0	1	0	1	0	0	0	0	1	1	3	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	11
17	1	1	1	1	2	1	1	1	2	2	9	0	5	3	6	2	0	2	2	0	0	1	2	0	2	0	0	0	0	47
18	0	0	1	0	3	2	2	5	6	5	9	4	8	7	8	5	4	6	5	5	2	1	1	0	3	2	1	0	0	95
19	0	0	0	1	3	1	3	3	7	12	8	5	4	10	20	7	8	6	2	1	6	5	4	1	2	0	0	0	0	119
20	1	0	2	2	3	0	2	3	3	7	8	11	12	12	15	9	5	7	7	3	4	4	5	3	3	0	0	0	0	131
21	0	0	0	0	3	3	1	6	3	0	11	7	7	8	7	10	6	5	11	2	6	2	3	1	3	1	2	0	0	111
22	0	0	1	1	1	1	1	4	0	3	5	5	2	2	9	4	5	2	9	8	5	1	2	0	0	0	3	0	0	74
23	0	0	0	0	2	0	1	1	1	1	3	2	2	5	2	2	2	1	1	1	0	1	0	0	0	0	2	0	0	30
24	0	0	0	0	0	0	0	2	0	1	5	3	2	3	3	2	3	1	1	1	1	1	1	0	2	0	0	0	0	33
25	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4	0	0	2	0	0	0	0	0	0	2	0	0	0	0	11
26	0	0	1	0	0	0	0	0	0	0	0	0	3	0	5	1	0	1	1	2	0	0	0	0	0	0	0	0	0	14
Total	3	1	7	5	18	8	11	25	22	32	60	40	45	51	76	47	33	33	39	23	25	16	18	5	18	3	8	0	0	676

Breadth of Shoulders. (*In Millimètres.*)

Years.	370	380	390	400	410	420	430	440	450	460	470	480	490	500	Total
16	0	1	1	3	0	1	0	2	1	1	0	0	0	0	10
17	5	1	4	4	5	7	10	4	4	1	1	1	0	0	47
18	1	3	6	13	13	14	8	15	12	5	3	1	0	0	94
19	2	1	4	6	13	31	26	16	12	7	2	1	0	0	121
20	0	1	4	3	17	26	23	21	18	11	5	2	2	0	133
21	0	0	5	3	8	18	18	24	17	8	5	1	3	0	110
22	0	0	2	3	5	10	16	12	13	7	5	3	0	0	76
23	0	1	1	1	4	3	6	7	1	4	3	0	0	0	31
24	0	0	1	3	2	2	3	10	4	5	1	0	1	1	33
25	0	0	0	0	2	2	1	1	3	1	1	0	0	0	11
26	0	0	0	1	0	1	1	2	3	5	1	0	0	0	14
Total	8	8	28	40	69	115	112	114	88	55	27	9	6	1	680

Breadth of Hips. (*In Millimètres.*)

Years.	300	305	310	315	320	325	330	335	340	345	350	355	360	365	370	375	380	385	Total.
16	0	2	0	2	2	2	1	0	1	0	0	0	0	0	0	0		0	10
17	4	9	2	10	3	5	3	5	0	2	1	0	1	0	0	0	0	0	45
18	3	10	10	9	9	11	15	6	6	4	3	2	0	0	0	0	0	2	90
19	5	7	10	20	19	14	14	14	7	3	4	0	0	2	0	1	1	0	121
20	8	2	11	14	21	18	18	9	12	7	3	3	2	0	0	0	0	2	129
21	3	4	9	15	11	17	14	12	7	1	3	1	0	0	0	0	0	0	108
22	4	3	5	6	7	11	9	7	11	4	2	2	1	0	0	0	0	0	72
23	2	1	2	3	2	4	7	1	5	0	1	0	2	0	0	0	0	0	31
24	1	1	2	2	2	3	4	7	6	1	2	0	0	0	1	1	0	0	33
25	1	0	1	0	0	3	1	1	1	2	1	0	0	0	0	0	0	0	11
26	0	0	1	1	0	3	0	1	3	1	3	1	0	0	0	0	0	0	14
Total	31	39	53	82	76	91	86	63	59	25	23	9	6	2	1	2	1	4	664

Length Shoulder Elbows. (*In Millimètres.*)

Years.	330	340	350	360	370	380	390	400	410	420	Total.
16	0	0	1	5	2	2	1	0	0	0	11
17	1	2	8	10	19	16	1	1	0	0	58
18	1	8	9	17	26	11	18	1	0	0	91
19	1	2	14	26	29	18	17	3	1	0	111
20	1	8	15	28	35	28	11	3	4	0	133
21	0	10	21	30	22	15	9	6	1	0	114
22	2	6	8	20	17	15	4	3	1	0	76
23	1	2	1	8	3	6	6	3	0	1	31
24	0	0	2	8	8	6	6	2	0	1	33
25	0	1	3	2	1	2	1	0	0	0	10
26	0	0	1	4	1	2	3	1	1	1	14
Total	7	39	83	158	163	121	77	23	8	3	682

Length Elbow Tips. (*In Millimètres.*)

Years.	400	410	420	430	440	450	460	470	480	490	500	510	Total.
16	0	0	0	0	2	3	4	0	2	0	0	0	11
17	0	2	2	3	7	14	7	9	1	0	1	0	46
18	0	2	5	4	12	20	18	17	11	4	1	1	95
19	0	2	14	13	19	23	23	20	11	5	1	1	122
20	0	2	4	10	22	25	26	26	10	5	1	1	132
21	0	2	2	12	24	23	16	16	6	8	2	0	111
22	1	0	4	5	12	18	14	10	6	4	1	0	75
23	1	0	0	3	3	5	4	4	6	2	0	1	29
24	0	0	1	1	7	5	6	8	1	3	0	1	33
25	0	0	0	0	3	3	2	1	1	1	0	0	11
26	0	0	0	1	2	1	3	2	3	0	2	0	14
Total	2	10	32	52	113	140	123	113	58	32	9	5	679

Length of Feet. (*In Millimètres.*)

Years.	235	240	245	250	255	260	265	270	275	280	285	290	Total.
16	0	0	2	0	2	0	3	2	1	0	0	0	10
17	1	2	5	9	9	8	6	3	3	0	2	0	48
18	1	6	9	12	9	23	19	7	6	2	0	0	94
19	3	7	12	12	24	20	20	15	4	3	0	1	121
20	2	6	7	21	19	26	25	12	8	2	4	0	132
21	2	3	6	27	18	17	18	9	5	4	0	0	109
22	3	1	3	14	16	11	11	8	5	0	1	1	74
23	2	0	4	3	6	8	2	1	3	1	0	1	31
24	0	0	2	7	10	4	3	3	2	1	0	1	33
25	0	0	0	3	0	4	3	0	1	0	0	0	11
26	0	0	2	1	3	3	1	0	3	0	0	1	14
Total	14	25	52	109	116	124	111	60	41	13	7	5	677

Stretch of Arms. (*In Millimètres.*)

Years.	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	Total.
16	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	1	1	1	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	11
17	0	0	1	0	0	1	2	2	2	1	2	3	3	3	3	4	4	4	3	2	2	1	2	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	46
18	0	0	1	0	0	1	2	2	2	3	4	4	4	5	5	6	4	4	6	3	3	7	7	3	3	1	1	3	3	1	1	0	1	0	0	0	0	1	0	92
19	0	1	0	1	1	1	4	4	2	3	6	7	2	3	7	7	8	8	6	5	6	7	6	5	3	3	3	4	2	2	1	0	1	0	1	0	0	1	0	122
20	1	1	1	1	1	1	1	2	4	4	2	5	7	8	7	7	6	7	9	9	8	8	7	8	4	4	3	3	2	2	1	2	0	1	0	0	1	0	1	136
21	1	0	0	0	1	1	1	2	3	4	5	5	8	8	5	5	6	6	5	6	3	3	5	4	5	2	2	2	1	1	0	2	2	0	0	1	0	0	0	109
22	0	0	0	1	0	0	2	1	2	2	2	1	3	4	3	4	6	7	3	3	5	6	2	3	3	2	2	1	0	1	0	0	0	1	0	0	0	0	0	73
23	0	0	0	0	0	0	0	1	0	1	2	2	0	1	1	1	1	2	0	1	2	1	2	2	1	2	1	2	1	1	0	1	0	0	0	0	0	1	1	30
24	0	0	0	0	0	0	0	0	2	1	1	2	1	1	2	2	1	1	0	0	2	3	3	2	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	33
25	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	2	1	1	0	0	0	1	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	1	11
26	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	14
Total	2	2	4	3	3	6	12	15	18	19	26	28	30	33	34	40	38	42	32	30	33	38	36	28	23	21	13	17	11	10	6	7	6	2	1	4	1	1	5	677

LUNG CAPACITY. (*In Litres and Hundredths.*)

Years.	2·90	3·10	3·30	3·50	3·70	3·90	4·10	4·30	4·50	4·70	4·90	5·10	5·30	5·50	5·70	5·90	6·10	6·30	6·50	6·70	Total.
16	0	0	0	3	2	1	2	2	0	0	0	0	0	0	1	0	0	0	0	0	11
17	0	2	4	7	7	4	3	6	4	4	2	2	0	0	0	0	0	0	0	0	45
18	1	2	5	8	11	15	9	10	12	10	3	3	2	1	1	0	0	0	0	0	93
19	0	3	6	9	17	17	13	18	16	4	7	3	3	3	2	0	0	0	0	1	122
20	1	3	4	9	18	11	15	15	14	15	6	12	4	2	3	1	0	0	0	0	133
21	0	1	4	7	16	14	10	14	7	11	10	6	4	2	1	0	1	0	0	0	108
22	0	1	1	7	4	8	9	7	11	9	7	3	4	3	0	1	0	0	0	0	75
23	1	0	1	4	1	2	1	6	5	2	2	3	1	0	0	0	0	0	2	0	31
24	0	0	3	1	1	1	3	9	6	2	3	2	2	0	0	1	0	0	0	0	34
25	0	0	0	1	1	0	1	1	2	1	3	0	0	0	0	1	0	0	0	0	11
26	0	0	0	0	2	1	3	3	1	0	3	1	0	0	0	0	0	0	0	0	14
Total	3	12	28	56	80	74	69	91	78	58	46	35	20	11	8	4	1	0	2	1	677

Gen. Pitt-Rivers's Explorations.

During the recent meeting of the British Association at Bath, General Pitt-Rivers brought out the second of the splendid volumes in which he has recorded the results of his excavations on his own estates on the borders of Wiltshire and Dorsetshire, and we take the present opportunity of laying before our readers a review of the two volumes,[1] hoping in this way to draw especial attention to the work so admirably carried out by the author, who possesses in an eminent degree all the qualifications necessary for explorations of this kind, such as knowledge and experience, wealth and leisure, and, above all, inexhaustible patience and enthusiasm, all which are amply exemplified in the volumes before us, which, by the liberality of their author, are placed in the library of the Institute, having been printed for private distribution only.

The Pitt-Rivers estates are situated just on the borders of Wilts and Dorset, counties full of relics of British and Roman times.

"The region in question," says General Pitt-Rivers in his preface, "strengthened by the dense forests which covered Dorsetshire at that time, appears throughout the early history of these islands to have served as a standing point for first established races, in resisting succeeding waves of immigration from the east. Here the abundance of long barrows shows that the Neolithic folk, of presumably Iberian origin, congregated in large numbers. Here the Goidels or earliest wave of the Celtic population, are shown by Professor Rhys to have resisted the succeeding wave of Brythons coming from the same quarter. Here also Mr. Green has shown in his "Making of England" the West Welsh, of whatever ethnic elements they may have been composed, withstood the Saxons for a long time after the latter had penetrated as far as Wilton."

A border-land such as this seems to offer a peculiarly favourable field for archæological research, especially as it includes a portion of that great forest tract known as Cranborne Chase, which, having for many centuries been free from the plough and the hoe, has preserved the remains within it undisturbed and unmixed with those of a later date.

Thurnam enumerates only twelve long barrows in Dorsetshire, and all on the borders of Wilts; but none of these seem to have come within the district explored by General Pitt-Rivers. Of round barrows he has opened a great number and finds that they all confirm Thurnam's theory, that the makers of these barrows were of a taller race than those who reared the gigantic long barrows, and brachycephalic, instead of dolichocephalic like the more ancient long-barrow people of the Stone Age. The round barrows opened by General Pitt-Rivers were found to be all of the Bronze Age, and contained some fine pottery and flint implements, although apparently fragments only of bronze. These tumuli would seem

[1] "Excavations in Cranborne Chase, near Rushmore, on the borders of Dorset and Wilts." By Lieutenant-General Pitt-Rivers, F.R.S., Vols. I and II, 1887–8.

to prove that the inhabitants of this part of the country, at all events during the Bronze Age, were Celts or Belgæ; but the further excavations of General Pitt-Rivers in the adjoining British villages reveal to us a much smaller dolichocephalic race, resembling so nearly the Neolithic folk of the long barrows of Wiltshire and Gloucestershire, as to be regarded by him as remnants of the same people, an idea confirmed by the measurements of Dr. Beddoe and Dr. Garson.

The period to which the relics found principally belong, is included between the coming of the Romans and the Saxon invasion. The people are designated as Romanized Britons, and it is suggested that their extremely small stature may be the result of slavery, or of the taller men having been drafted into the Roman legions.

Among the many curious facts relating to these people, that which seems the most singular is the complete change in the mode of burial. Assuming them to belong to the same race as the long barrow people, we find that not only have they forsaken the rearing of gigantic tumuli, but they seem to have gone to the other extreme, and to have buried their dead in ditches or pits, the latter being apparently disused chalk pits, from which chalk had been excavated for agricultural purposes, and which have been filled up, and afterwards used for sepulchral purposes as being easier of excavation. This change of burial customs may perhaps be due to Roman influence, but in that case we should expect to find burials according to Roman methods; these, however, do not appear to have been found, and from the fact recorded, that in two cases of burial in these pits there seems evidence that death resulted from stoning, the idea suggests itself that these burials were only of the poor or criminal classes, and that the sepulchres of the more wealthy have yet to be found, perhaps in a necropolis at some distance from the villages, an idea which seems reasonable from analogy, and from the very small number of weapons or ornaments found with these remains. But although the Romanised Britons had given up the rearing of long barrows, they do not seem to have forgotten how to throw up gigantic earthworks, for Bokerley Dyke in which many of the relics were found is a great fortification nearly nine miles in length, raised apparently for the protection of villages to the westward, from the Saxon invaders pressing upon them from the East. This great dyke may be compared with the still greater Wansdyke, the date of which has yet to be ascertained, but the sections cut by General Pitt-Rivers in Bokerley Dyke, show the date of that with tolerable precision, as 500 Roman coins, some as late as Constantius, have been found there.

The Romano-British villages of Woodcuts and Rotherley, the chief scene of General Pitt-Rivers's excavations, both lie to the rear of Bokerley Dyke, and in both there are enclosures, entrenchments, and ditches, apparently designed to separate the various quarters into which each village was divided, and which, perhaps, were occupied by different ranks or sections of the population, as was

the case in many ancient cities. At Rotherley, the centre of the village appears to have been enclosed within a circular rampart and ditch, the former at present of insignificant height, but perhaps originally much higher. General Pitt-Rivers points out that these circular enclosures are common in British villages, and says they are sometimes called "sacred circles." The plan on the map is certainly strongly suggestive of the great earthwork surrounding the gigantic stone circles at Avebury, and both bear a considerable resemblance to Irish Raths, assigned by tradition to the "*little folk*," or fairies, which, taken in connection with the extremely small size of the ancient inhabitants of these Romano-British villages, may point to a racial connection between the constructors.

Most of the relics found in these villages were described by General Pitt-Rivers in a paper published in the Journal of this Institute for February, 1888, but we may here briefly recapitulate; they consist chiefly of pottery of various kinds, including New Forest ware and Samian, with British imitations of the latter, and in the barrows of the Bronze Age drinking cups of ancient British make. The bronze and iron articles include many fibulæ of peculiar form and considerable beauty; a few fibulæ of silver and of silver and bronze gilt have also been found, but no gold object is recorded. Of glass, jet, and coral we have a few specimens, but Kimmeridge shale seems to have been the chief substance employed for ornamental purposes. The beautiful engraving on a tablet of this shale found at Rotherley is reproduced on the handsome binding of General Pitt-Rivers's volumes; this is supposed to have been a writing tablet, and to have been covered with wax; an iron stylus has also been found, but no inscriptions of any kind. We must refer our readers to the volumes for the minute measurements and illustrations of the several finds and of the human and animal remains, all of which are given with the greatest possible care and attention to the locality and to the depth of the excavation. An examination of these tables will show the difference between the men and domesticated animals of the Romano-British period, and those of the present day. The horses and cows were small, and it would seem that both were used as beasts of burthen, as iron shoes of both have been found. The horse shoe of that day was apparently lighter and better adapted to the animal's hoof than that now in use. General Pitt-Rivers calls attention to the sinuosity of the edge, which reminds us of one in the Museum at Cirencester, said to be Roman, but which is lighter and more decidedly sinuous than either of those figured in these volumes. These people were evidently agriculturists, cultivating their land in terraces, and the wheat grown by them was of nearly the same quality as that now grown at the same height, and shows an advance upon the cultivation of pre-Roman times. Many querns for grinding this wheat have been found, but no ploughs or other agricultural implements, except some iron spuds, an iron-bound spade, and a reaping-hook; there are, however, some singular articles termed hippo-sandals,

the use of which appears doubtful, but which were either attached to the horses' feet, or to a primitive kind of cart without wheels.

The sheep were tall and slender resembling the St. Kilda breed, and the dogs were of all sizes, one being a Dachshund. The people apparently kept bees, as several perforated pieces of pottery are supposed to have been used as colanders for straining honey, and we may reasonably suppose they made mead or some similar liquor: they also had spindle whorls, some of Kimmeridge shale and some of stone and bone, therefore they made their own cloth, but no specimen of the manufactured cloth has been found. The absence of all traces of religion is very curious, two or three flint implements are regarded by General Pitt-Rivers as having been used as amulets, but there are no images of Roman deities; none of those little figures denominated idols, in stone or terra-cotta; no emblems of sun, moon, or stars; no particular position or orientation of the dead, although most are buried in the crouching attitude common to savages; no stone circles or monoliths, in fact there seems nothing to show that they had any religion at all, which is strange considering the undoubted Roman intercourse which was maintained for centuries, the coins found dating from Caligula, A.D. 75, to Magnentius, A.D. 353. Among the most curious of the discoveries made are several hypocausts of singular construction, the use of which is not quite clear. They are usually square or oblong, cut in the solid chalk, with a trench round covered with flints, and a kind of oval basin at one end, in which it is conjectured the stokers stood to attend to the fire: many flints which have evidently been burnt are found in these hypocausts, and it is supposed these were heated in the furnace, and used as pot boilers. These hypocausts may perhaps have been the public cooking places of the village, or they may have been used after the manner of the Roman hypocausts for heating houses. A somewhat similar structure, but round in form, was described by Mr. Kinahan (in the Journal of of the Institute for February, 1883) as existing at Cummer, County Wexford, where also pits resembling those at Woodcuts and Rotherley were found. Mr. Kinahan suggests that this circle with the pavement of burnt stones, may have been a place of sacrifice, but cannot understand why stones should be found mixed with the wood ashes. Was this a hypocaust similar to those described by General Pitt-Rivers? We remember having been shown a somewhat similar structure in Cornwall, which was said to have been used for burning the dead.

The elaborate system of drainage in these villages, and the change in that, and in the level of two Roman wells discovered, were pointed out by General Pitt-Rivers in the paper already referred to, as proving a difference in the rain-fall during the time these villages were occupied, and we need not therefore do more than draw attention to this very interesting and important point. The latest recorded excavations in these volumes are those carried out at Winklebury Camp and Hill, and in the adjoining barrows. Winklebury is one mile from Rotherley, and thirteen

from Salisbury: the camp is said to be that of Vespasian, but General Pitt-Rivers says it is certainly not of Roman construction. The finds here are chiefly pre-Roman of the Iron Age, the pottery is rougher, and the flint flakes and implements numerous. The barrows are British, and contain British pottery of several kinds, and bronze implements, but they are surrounded by Saxon graves, and secondary Saxon interments would seem to have taken place in some of the barrows. In the Saxon graves evidence is afforded of orientation of the body in burial. All the skeletons, with one exception, lie with the head to the west, facing north, in an extended position; and with some of them were interred iron knives and other curious articles in the same metal. On one skeleton was found a sort of double fibula of bronze discs coated with silver, and attached to a piece of wood and iron links, beneath which was found a piece of cloth. Some of the skeletons wore on the neck glass beads with spirals of different colours, the adder's bead of the Britons.

It is impossible in a notice of this kind to touch upon every point of interest presented in this valuable work. The reliable anthropological data afforded by it will be fully appreciated by all students of the "science of man." Three distinct peoples are brought before us: the tall brachycephalic men of the bronze age, buried in round barrows; the short dolichocephalic Romanised Britons, possibly and probably the descendants of the Neolithic folk of Thurnam's long barrows; and lastly the Saxons, "all contained within a radius of about three quarters of a mile." The relics, animal, vegetable, and mineral, works of art, and personal ornaments, and relative position of each, have been carefully tabulated, in order to facilitate reference, and the most minute and scientific measurements of the human and animal remains by Drs. Beddoe and Garson are given, all as General Pitt-Rivers is careful to inform us in the interests of truth, and not with the idea of establishing any pet theory. We cannot do better than conclude this notice in the words of the author: "A good deal of the rash and hasty generalisation of our time arises from the unreliability of the evidence upon which it is based. It is next to impossible to give a continuous narrative of any archæological investigation that is entirely free from bias; undue stress will be laid upon facts that seem to have an important bearing upon theories that are current at the time, whilst others that might come to be considered of greater value afterwards are put in the background, or not recorded; and posterity is endowed with a legacy of error that can never be rectified. But when fulness and accuracy are made the chief subject of study, this evil is in a great measure avoided."

We rejoice to hear that General Pitt-Rivers intends to resume his investigations, and anticipate still more important results from future explorations.

A. W. Buckland.

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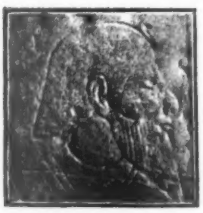

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PROFILES FROM THE EGYPTIAN MONUMENTS.